



APRIL 1995  
16-50025-101  
FINAL

A large, bold, black, hand-painted style text that reads "NO FEAR". The letters are slightly irregular and have a textured appearance. A small black dot is located at the bottom right of the letter "R".

## OPERATIONS MANUAL INCLUDES

Operations & Adjustments • Testing & Problem Diagnosis • Parts Information •  
Wiring Diagrams & Schematics

Williams Electronics Games, Inc., 3401 N. California Avenue, Chicago, IL 60618

## DIP SWITCH SETTINGS AND JUMPERS

EPROM Jumper Settings for U6	W1	W2
1MEG, 2MEG, 4 MEG EPROM	In	Out

### DIP Switch Chart

COUNTRY	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
AMERICA	Off	Off	On	On	On	On	On	On
EUROPEAN	Off	Off	On	On	On	Off	On	On
FRENCH	Off	Off	On	On	On	On	Off	Off
GERMAN	Off	Off	On	On	On	On	On	Off
SPAIN	Off	Off	On	On	Off	On	On	On

## SOLENOID/FLASHER TABLE

SOL. NO.	FUNCTION	SOLENOID TYPE	VOLTAGE CONNECTIONS			DRIVE XISTOR	DRIVE CONNECTIONS			DRIVE WIRE	SOLENOID PART NUMBER	
			PLAYFIELD	BACKBOX	CABINET		PLAYFIELD	BACKBOX	CABINET		FLASHLAMP TYPE	PLAYFIELD
01	RIGHT POPPER	High Power	J107-2			Q82	J130-1			VIO-BRN	AE-23-800	
02	AUTO PLUNGER	High Power	J107-2			Q80	J130-2			VIO-RED	AE-23-800	
03	RIGHT MAGNET	High Power	J107-2			Q78	J130-4			VIO-ORG	20-10197-2*	
04	KICKBACK	High Power	J107-2			Q76	J130-5			VIO-YEL	AE-23-800	
05	CENTER MAGNET	High Power	J107-2			Q64	J130-6			VIO-GRN	20-10197-1*	
06	LEFT MAGNET	High Power	J107-2			Q66	J130-7			VIO-BLU	20-10197*	
07	KNOCKER	High Power	J107-2			Q68		J130-8		VIO-BLK	AE-23-800	
08	DROP TARGET DOWN	High Power	J107-2			Q70	J130-9			VIO-GRY	SM1-26-500	
09	NOT USED	Low Power				Q58				BRN-BLK		
10	RIGHT SLINGSHOT	Low Power	J107-3			Q56	J127-3			BRN-RED	AE-26-1200	
11	LEFT SLINGSHOT	Low Power	J107-3			Q54	J127-4			BRN-ORG	AE-26-1200	
12	DROP TARGET UP	Low Power	J107-3			Q52	J127-5			BRN-YEL	AE-26-1200	
13	NOT USED	Low Power				Q50				BRN-GRN		
14	TRough	Low Power	J107-3			Q48	J127-7			BRN-BLU	AE-26-1500	
15	EJECT	Low Power	J107-3			Q46	J127-8			BRN-VIO	AE-27-1200	
16	SKULL MOUTH	Low Power	J107-3			Q44	J127-9			BRN-GRY	SM-30-1100	
17	FLIPPER RETURN FLS (2)	Flashlamp	J107-6			Q42	J126-1			BLK-BRN	#89 (2)	
18	SPINNER FLS	Flashlamp	J107-6			Q40	J126-2			BLK-RED	#906 (1)	
19	NO FEAR FLS	Flashlamp	J107-6			Q38	J126-3			BLK-ORG	#906 (1)	
20	RIGHT RAMP FLS (3)	Flashlamp	J107-6	J106-5		Q36	J126-4	J125-5		BLK-YEL	#89 (1) #906 (2)	
21	SKULL FLS (3)	Flashlamp	J107-6	J106-5		Q28	J126-5	J125-6		BLU-BRN	#906 (2) #906 (1)	
22	INSERT EXPLODE FLS	Flashlamp		J106-5		Q30		J125-7		BLU-BLK	#906 (1)	
23	LEFT RAMP FLS (3)	Flashlamp	J107-6	J106-5		Q34	J126-7	J125-8		BLU-VIO	#89 (1) #906 (2)	
24	TOP LEFT FLS	Flashlamp	J107-6			Q32	J126-8			BLU-GRY	#906 (1)	
25	AUTOFIRE FLS (2)	Gen. Purpose	J107-6			Q26	J122-1			BLU-BRN	#89 (2)	
26	TOP LEFT INSERT FLS	Gen. Purpose		J106-5		Q24		J124-2		BLU-RED	#906 (1)	
27	TOP RT INSERT FLS	Gen. Purpose		J106-5		Q22		J124-3		BLU-ORG	#906 (1)	
28	RIGHT POPPER FLS	Gen. Purpose	J107-6			Q20	J122-4			BLU-YEL	#89 (1)	
29-36	SEE FLIPPER CKTS											
37	NOT USED	Low Power				Q16				BRN-WHT		
38	NOT USED	Low Power				Q15				BLK-WHT		
39	NOT USED	Low Power				Q14				ORG-WHT		
40	NOT USED	Low Power				Q13				YEL-WHT		
41	NOT USED	Low Power				Q9				CRN-WHT		
42	NOT USED	Low Power				Q10				BLU-WHT		
43	NOT USED	Low Power				Q11				VIO-WHT		
44	NOT USED	Low Power				Q12				CRY-WHT		

### GENERAL ILLUMINATION

01	PLAYFIELD TOP	G.I.		J121-1		018	J121-7			WHT-BRN	#555
02	PLAYFIELD RIGHT	G.I.	J120-2	J121-2		010	J120-8	J121-8		WHT-ORG	#44 #555
03	PLAYFIELD LEFT	G.I.		J121-3		014	J121-9			WHT-YEL	#555
04	INSERT TITLE	G.I.	J120-5			Q16	J120-10			WHT-GRN	#44
05	INSERT BACKGROUND	G.I.	J120-6		J119-3	Q12	J120-11		J119-1	WHT-VIO	#44

FLIPPER CIRCUITS	VOLTAGE CONNECTION		POWER	DRIVE XISTOR	DRIVE CONNECTION		POWER	DRIVE WIRE	COIL PART NUMBER	COIL COLOR
	POWER	Hold			PLAYFIELD	POWER				
29	Power	J907-1 (RED-GRN)	Q4		J902-13		YEL-GRN			
30	Lower Right Flipper	Hold	J907-1 (RED-GRN)	Q11	J902-11		ORG-GRN		FL-11629	BLUE
31	Power	J907-4 (BLD-BLU)	Q3		J902-9		YEL-BLU			
32	Lower Left Flipper	Hold	J907-4 (BLD-BLU)	Q9	J902-7		ORG-BLU		FL-11629	BLUE
33	Power	J907-6 (RED-VIO)	Q2		J902-6		YEL-VIO			
34	Upper Right Flipper	Hold	J907-6 (RED-VIO)	Q7	J902-4		ORG-VIO		FL-11629	BLUE
35	Power	J907-8 (RED-GRY)	Q1		J902-3		YEL-GRY			
36	Upper Left Flipper	Hold	J907-8 (RED-GRY)	Q5	J902-1		ORG-CRY		NOT USED	NOT USED

J1XX-X-POWER DRIVER BOARD; JX-X=AUX. DRIVER BOARD; J9XX-X=FLIPTRONIC II BOARD

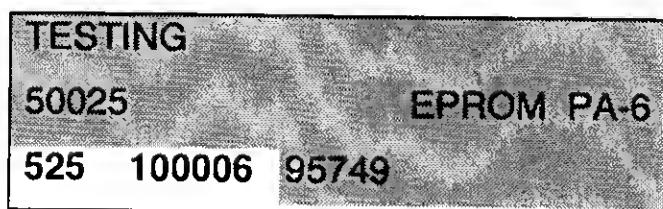
24-6549=#44 BULB; 24-8704=#89 BULB; 24-8768=#555 BULB; 24-8802=#906; 24-8825-#545

\*EACH MAGNET USES A WAVE SPRING WASHER; PART NUMBER 20-9612.

## **ATTENTION**

The game uses a new Security CPU Board that is not downward compatible to the CPU boards used in previous games. The new board has an added security chip that can be interchanged between other NO FEAR games and software revision levels. The CPU board itself is interchangeable with later model games, but must be equipped with the correct security chip and software for that specific game.

The games' electronic ID number is shown in the display during power-up. The number displayed is the same nine digit number printed on the security chip label. The first three digits are the project number without the country specific code. An example of the power-up display is shown below, the electronic ID number is bolded.



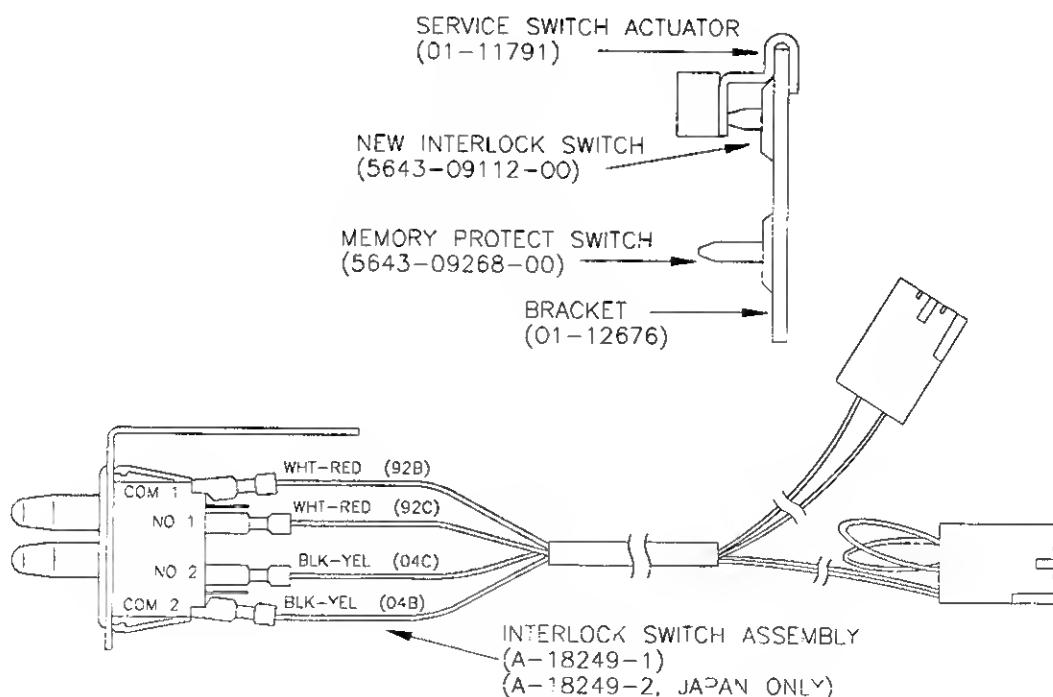
# **IMPORTANT NOTICE**

## **PLEASE READ**

This pinball game is equipped with a SAFETY FEATURE to prevent shocks from the solenoid circuit when the coin door is opened. A new interlock switch assembly (part no. A-18249-1), located at the left of the coin door opening, has been added to the game. This assembly is a bracket containing the existing memory protect switch on the bottom and a new interlock switch on the top. When the coin door is opened, this new interlock switch opens, breaking the connection to the +50V and +20V winding of the transformer secondary.

A special tool called the Service Switch Actuator is provided for the serviceman/technician that repairs the game. This tool is painted yellow and located in a bag stapled inside the cabinet. The service Switch Actuator slips over the interlock switch and holds it closed while the coin door is opened, allowing the serviceman to test and repair the solenoid circuit.

Hold the top interlock switch in, then slide the short end of the Service Switch Actuator over the top of the interlock switch bracket and the long end over the center of the switch plunger to hold it in.





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Information current at time of release.

Williams Electronics Games, Inc. reserves the rights to make modifications and improvements to its products. The specifications and parts identified in this manual are subject to change without notice.

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**NO  
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**RULES AND SHOT MAPS**

## **RULES**

### **SKILL SHOT:**

SHOOT THE JUMP RAMP TO COLLECT SELECTED AWARD.

### **CHALLENGES:**

SHOOT START CHALLENGE TO START CHALLENGE MODES. LISTEN TO THE SKULL FOR INSTRUCTIONS. COMPLETE ALL CHALLENGES AND MEET YOUR MAKER.

### **MULTI-BALL:**

SHOOT THE DROP TARGET TO LIGHT LOCKS. SHOOT SKYDIVE AND SKULL JACKPOTS TO LIGHT SUPER JACKPOTS.

### **SUPERCROSS RAMPS:**

SHOOT ALTERNATING RAMPS TO START PAYBACK TIME. SHOOT ALL SHOTS TO COLLECT BIG POINTS.

### **EXTRA BALL:**

SHOOT CONSECUTIVE RACEWAYS TO LIGHT EXTRA BALL. SHOOT SKULL TO COLLECT EXTRA BALL.

### **KICKBACK:**

SHOOT CLIFF TARGETS TO LIGHT KICKBACK.

### **TUBE SHOT:**

AWARDS RANDOM FEATURES. HOLDS BALL DURING MULTI-BALL.

### **THE SUMMIT:**

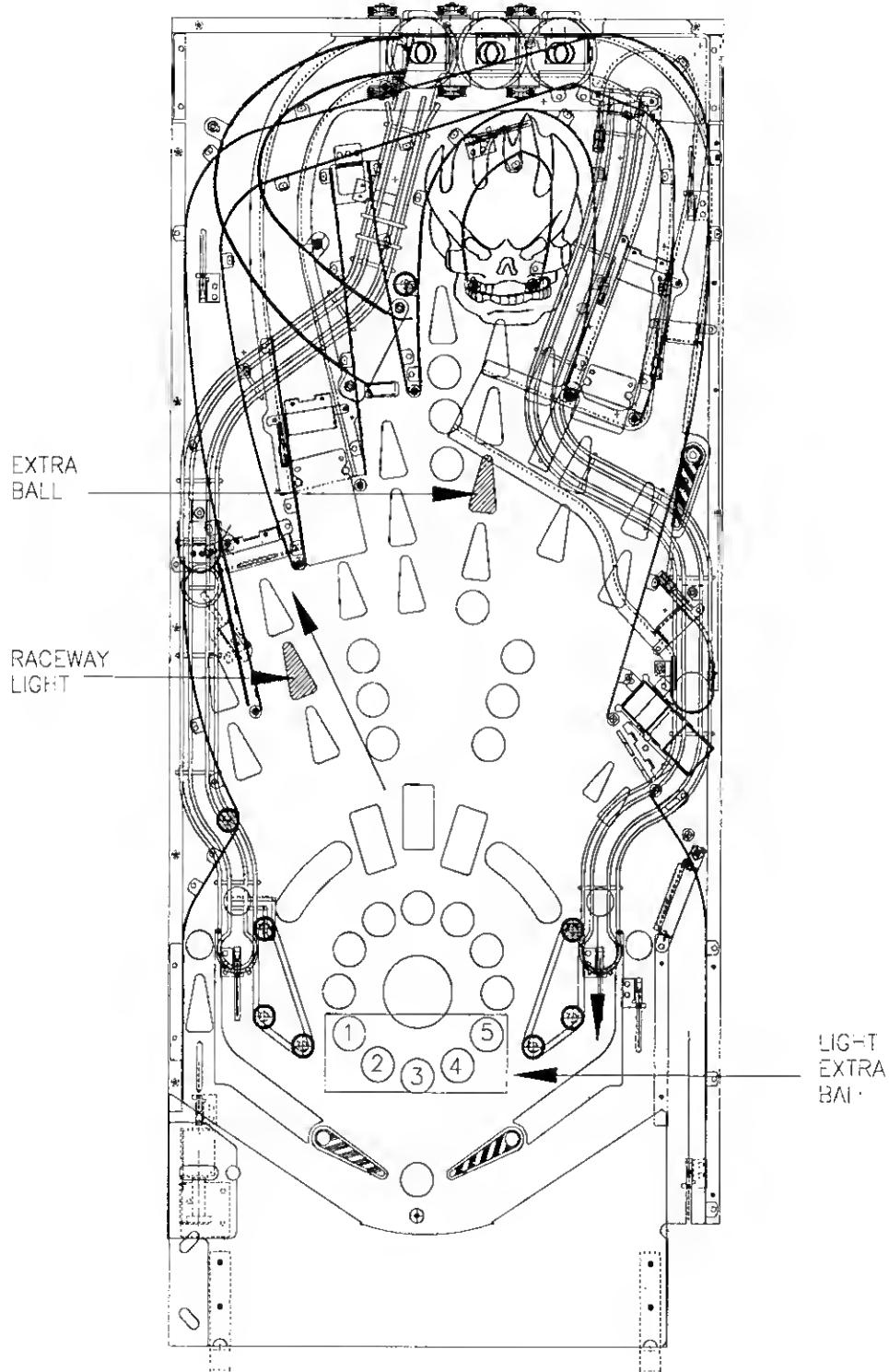
EACH SUMMIT SHOT AWARDS CONSECUTIVE FEATURE.

### **JUMP THIS:**

SHOOT THE JUMP RAMP AS MANY TIMES AS POSSIBLE FOR MAXIMUM POINTS.

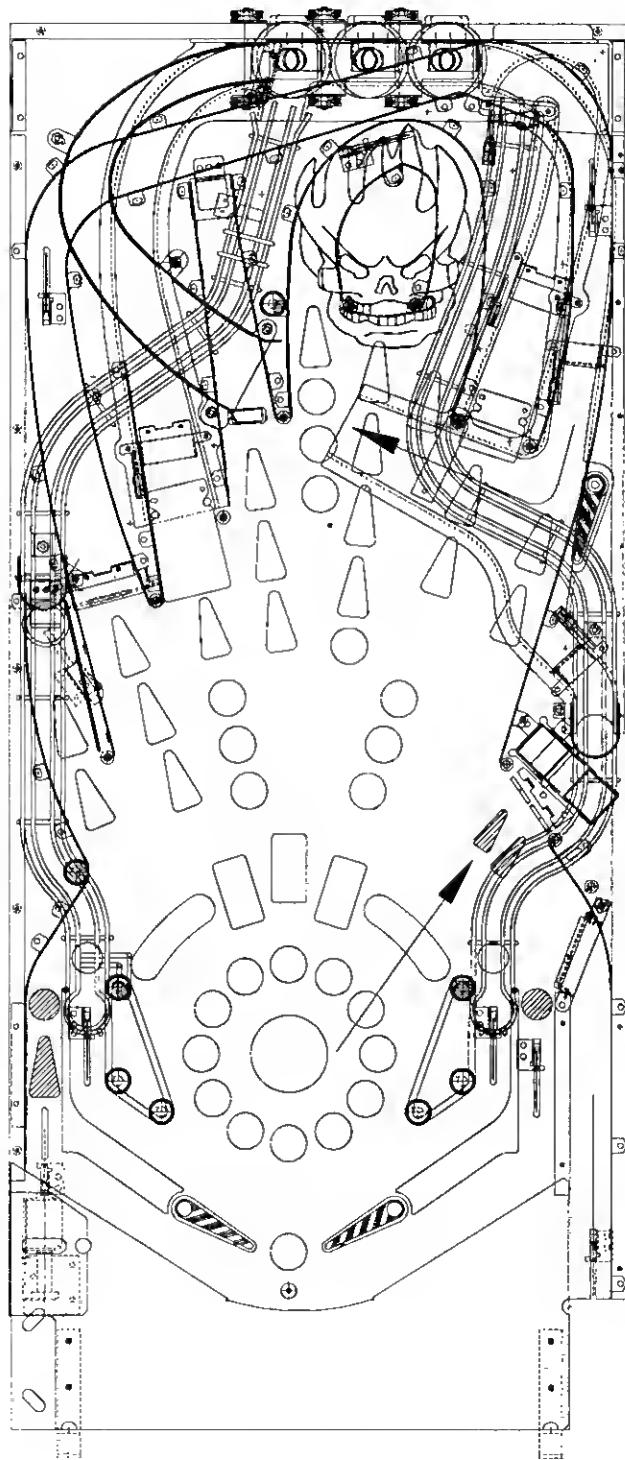
## RACEWAYS AND EXTRA BALL

Lights 1 to 5 are lit by making repeated loop shots through the RACEWAY spinning target around to the right flipper. RACEWAY is lit by the RACEWAY once, or by the right return lane. Percentaging software determines how many loops are required to complete LIGHT EXTRA BALL.



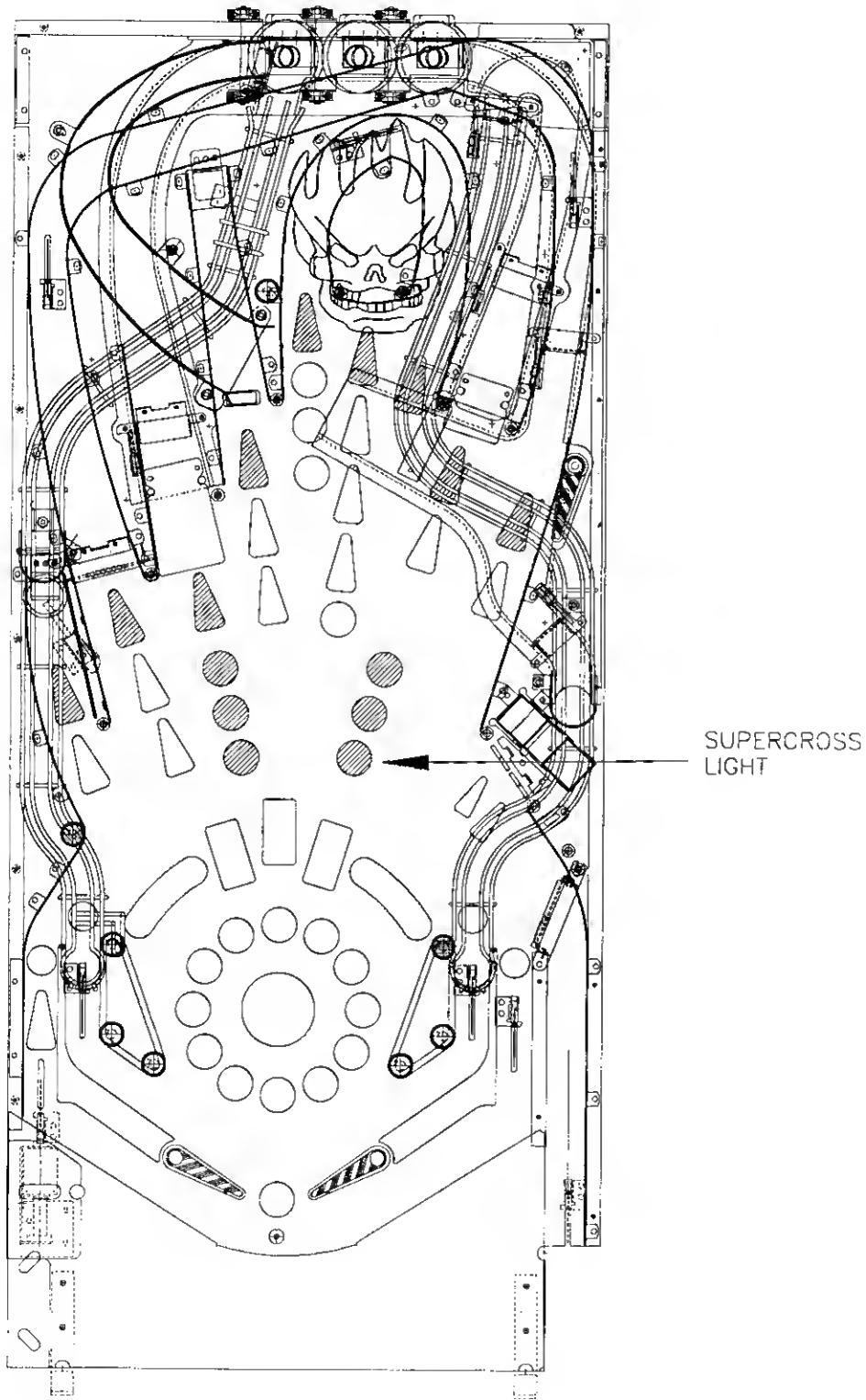
### **KICKBACK AND JUMP THIS (exit lanes)**

Completing the CLIFF targets at any time will relight KICKBACK (if unlit) and advance the climber (shown on the display). When the climber has reached the top of the mountain, JUMP THIS, will be lit. The JUMP THIS lights will toggle back and forth between the exit lanes with every sling hit. A ball draining down the exit lane with JUMP THIS lit will be Autofired back into play and the JUMP SHOT will be worth big points.



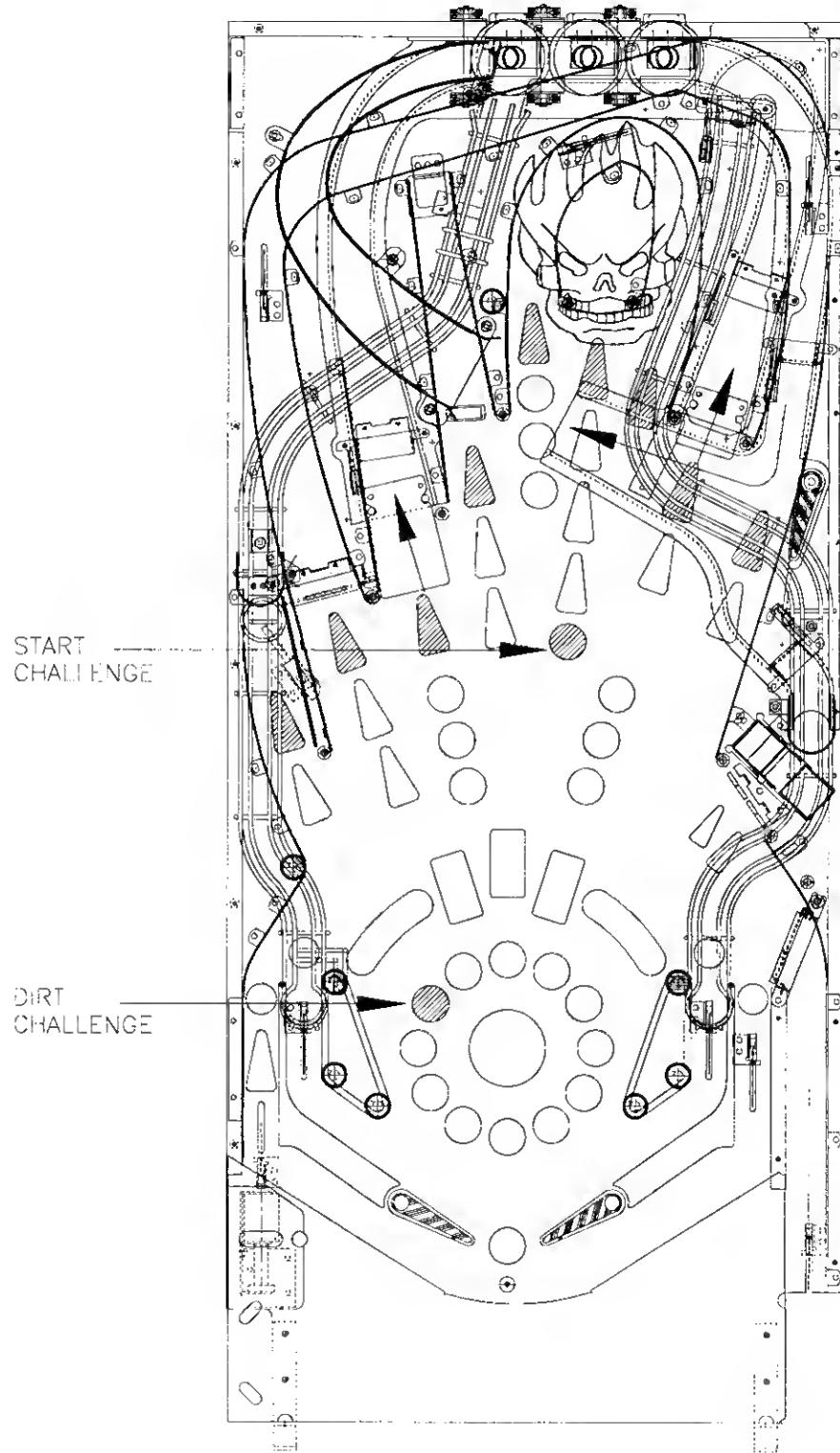
## SUPERCROSS RAMPS

Alternately completing the ramp shots will advance the SUPERCROSS lights. Completing all SUPERCROSS lights starts PAYBACK TIME. All shots are now lit for 25 Million a shot. PAYBACK TIME ends when the timer reaches zero.



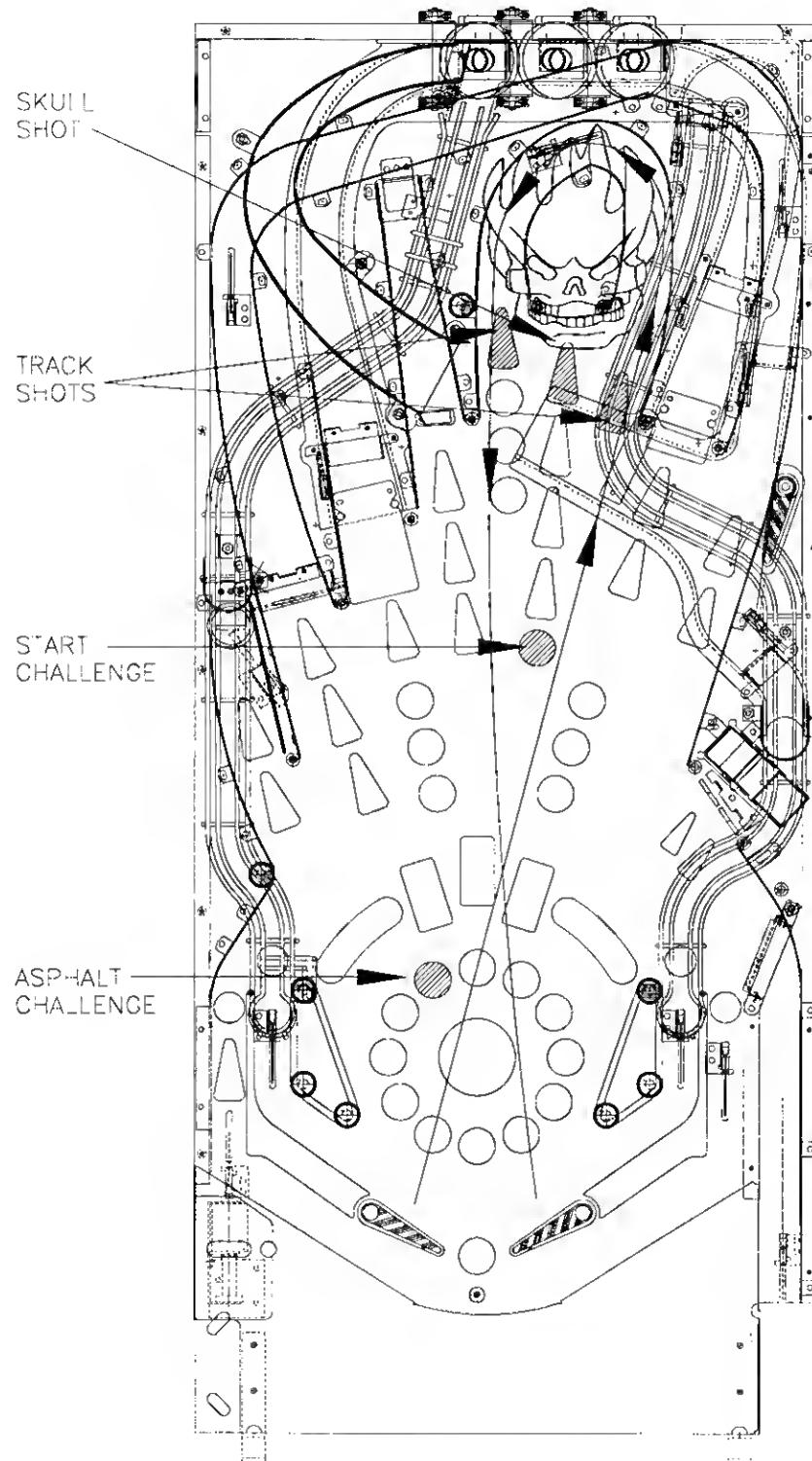
## DIRT CHALLENGE

When DIRT CHALLENGE is flashing, and the player shoots START CHALLENGE, all shots are lit, and build RAMP VALUE (Hill Climb and Hairpin). The Ramps and the Jump Shot build, and collect that value. DIRT CHALLENGE is over when the displayed timer reaches zero.



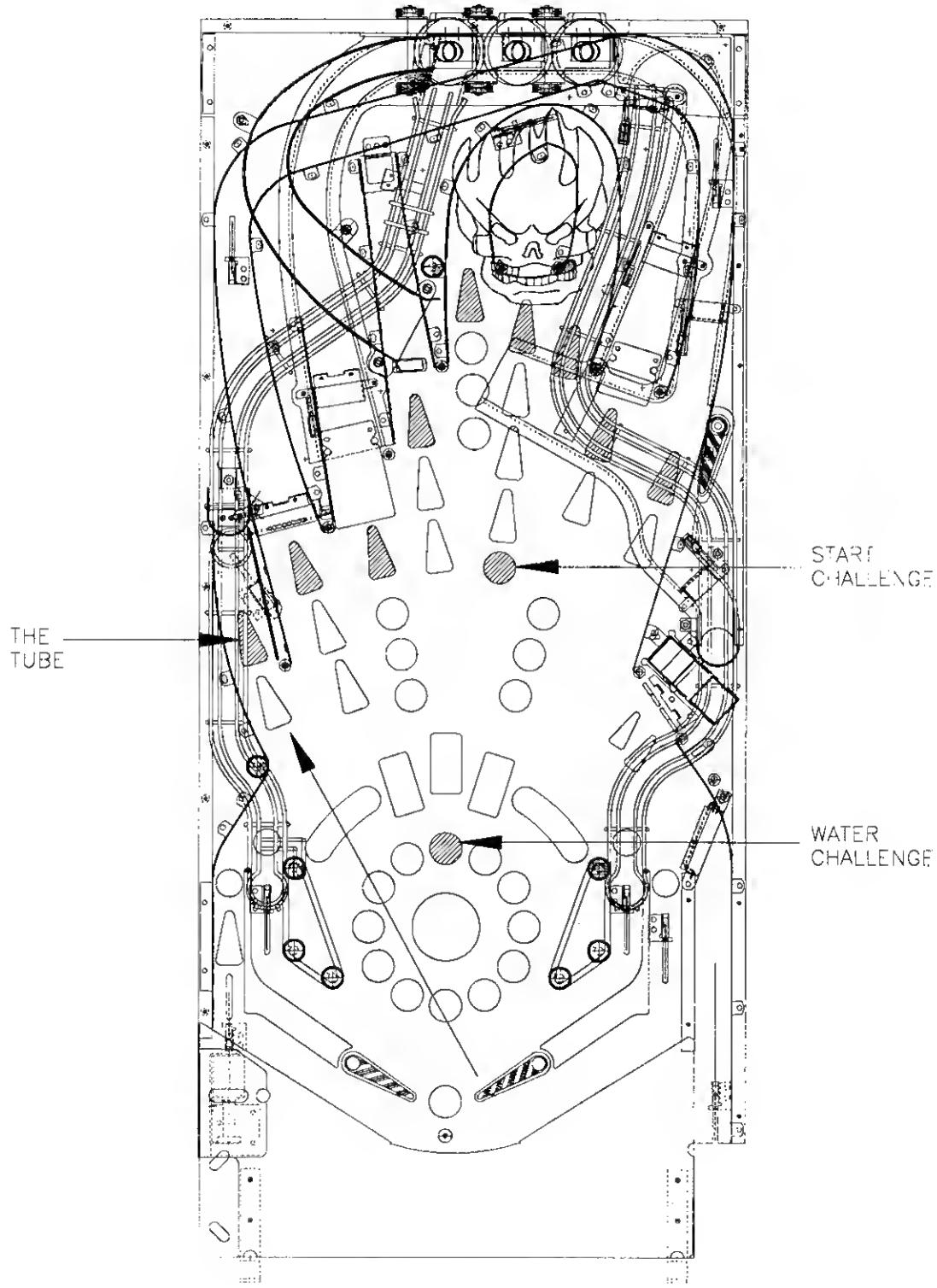
## ASPHALT CHALLENGE

When ASPHALT CHALLENGE is flashing and the player shoots START CHALLENGE, the TRACK and SKULL shots are lit. Each time the player shoots one of these shots, the STEERING WHEEL lights are advanced. Completing all three STEERING WHEELS before the timer reaches zero awards the player with a range of features, including lighting an EXTRA BALL.



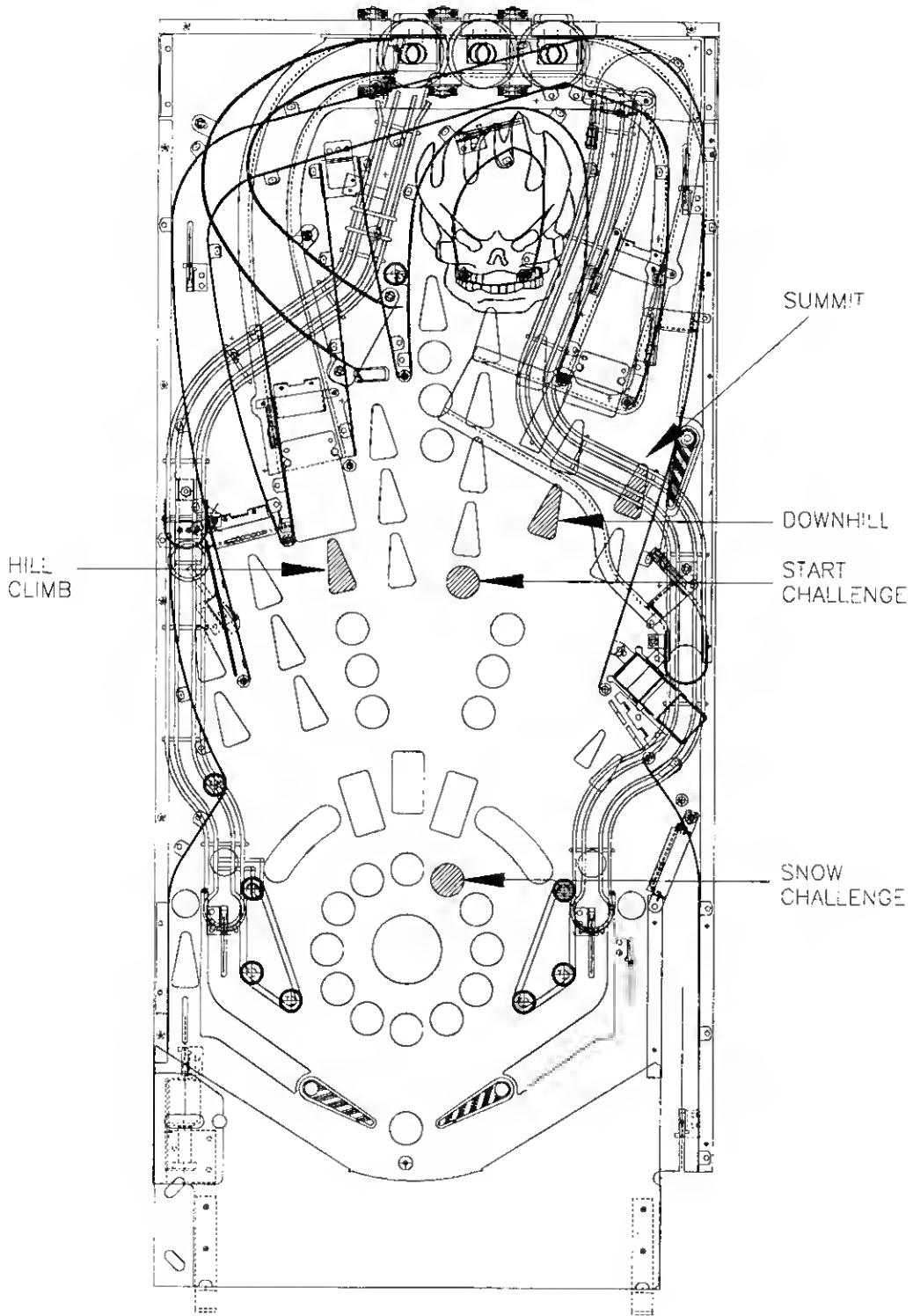
## WATER CHALLENGE

When WATER CHALLENGE is flashing and the player shoots START CHALLENGE, all shots are lit for 5 Million. Each time the player shoots the TUBE, the value of the shots are increased by 5 Million (up to a maximum of 25 million), and the challenge timer is increased. WATER CHALLENGE ends when the timer reaches zero.



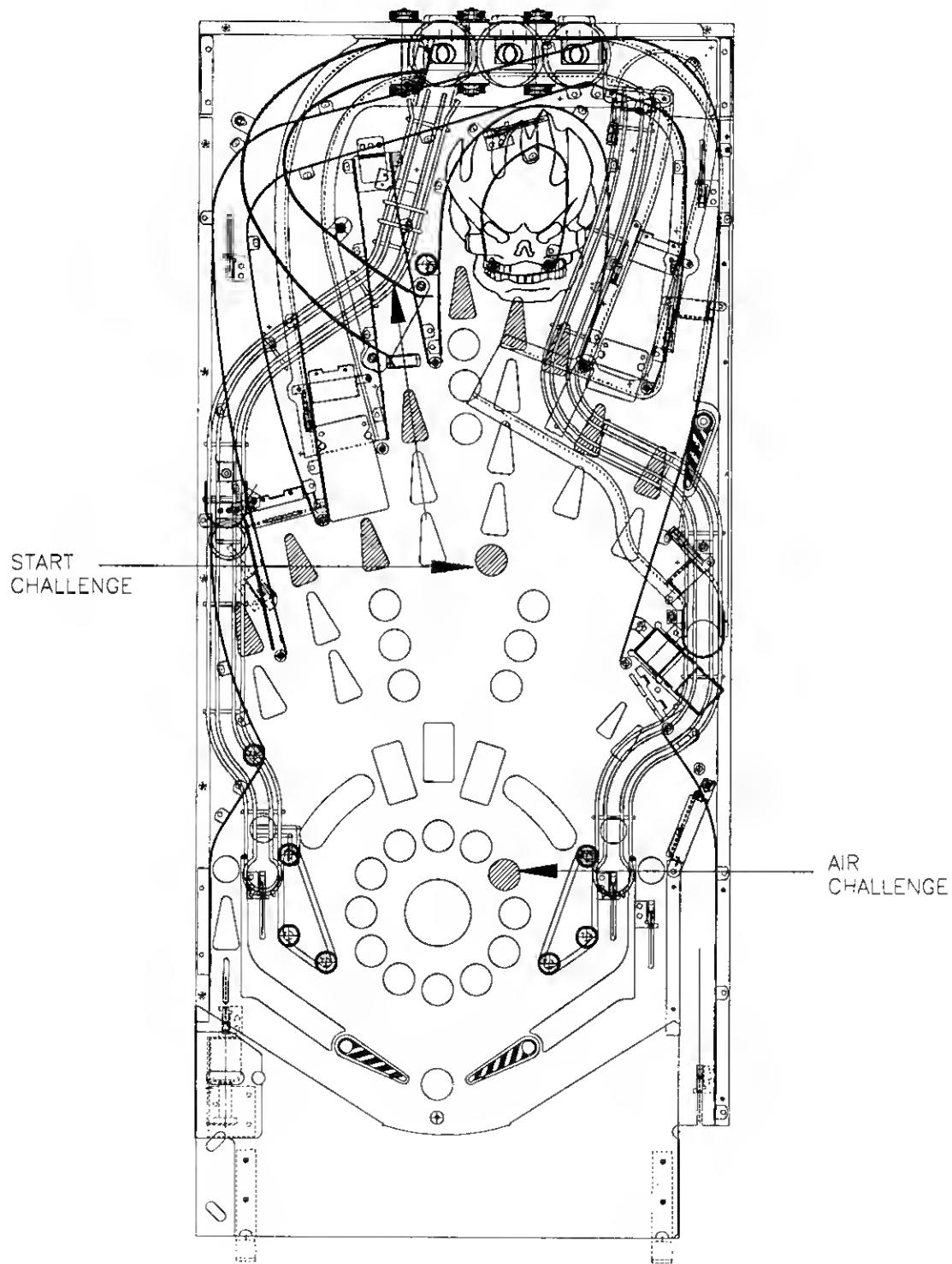
## SNOW CHALLENGE

When SNOW CHALLENGE is flashing and the player shoots START CHALLENGE, HILL CLIMB, DOWNHILL, and SUMMIT shots are lit. HILL CLIMB and SUMMIT shots build the DOWNHILL value. Shooting the DOWNHILL ramp before the timer reaches zero awards the current DOWNHILL value, and ends the SNOW CHALLENGE.



### AIR CHALLENGE

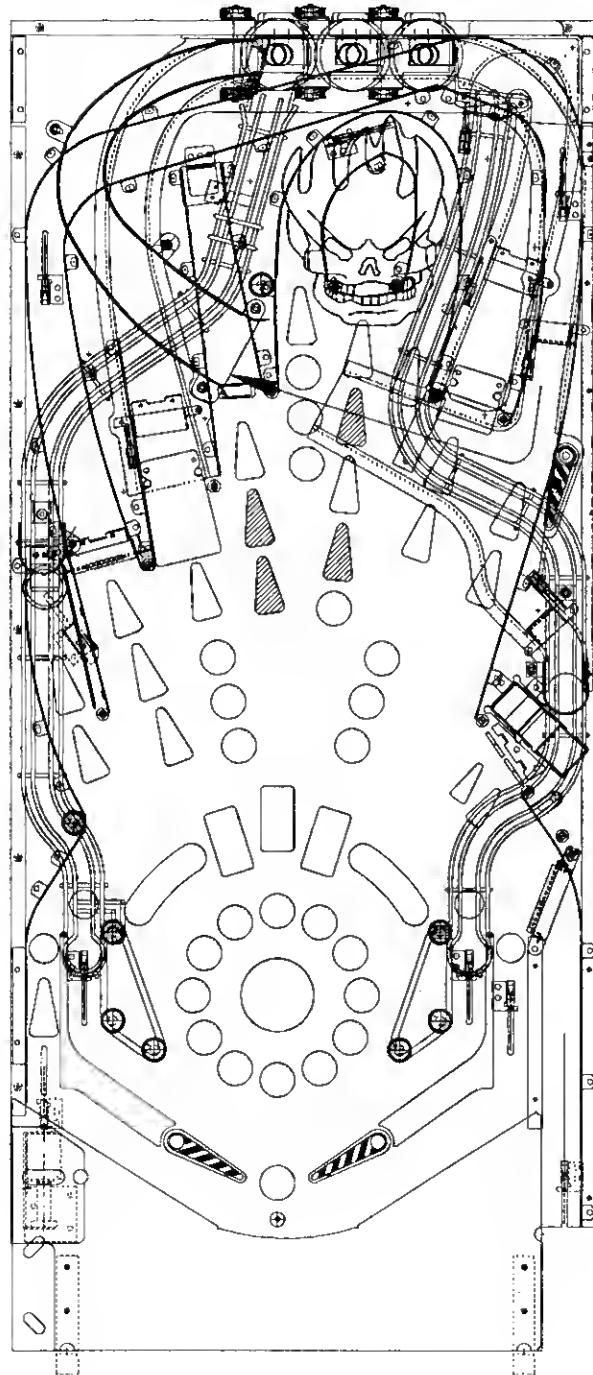
When AIR CHALLENGE is flashing and the player shoots START CHALLENGE, SKYDIVE is lit, and a hurry-up value begins to countdown on the display. Shooting SKYDIVE awards the current hurry-up value, and locks that value in for all shots, which become lit. After each successful shot, the locked-in point value is awarded, and that light is turned off. Completing all lit shots before the timer expires awards a bonus.



## LOCKS AND MULTIBALL

Hitting the drop target at the SKYDIVE shot will light locks at the SKULL and/or at the SKYDIVE. Shooting LOCK three times during the game will start 3 BALL MULTIBALL.

At the start of Multiball, the JACKPOT will be lit at the SKULL. If this Jackpot is awarded, the JACKPOT will then move to the SKYDIVE shot. If this Jackpot is awarded, then SUPER JACKPOT will be lit on the HILL CLIMB ramp. Repeated JUMP SHOTS will award SUPER JACKPOTS. Once the player has missed a jumpshot, the JACKPOT shot returns to the SKULL, and the sequence repeats until Multiball is over.



# **SECTION ONE**

## **GAME OPERATION AND TEST INFORMATION**

### **(System WPC) ROM SUMMARY**

<b>IC</b>	<b>TYPE</b>	<b>BOARD</b>	<b>LOCATION</b>	<b>PART NUMBER</b>
Game 1	27c040	CPU	U6	A-5343-50025-1A (Domestic)
Game 1	27c040	CPU	U6	A-5343-50025-1X (Foreign)
Security Chip	27c040	CPU	U22	A-5400-50025-1
Music/Speech	27c040	Audio	SU2	A-5343-50025-S2
Music/Speech	27c040	Audio	SU3	A-5343-50025-S3
Music/Speech	27c040	Audio	SU4	A-5343-50025-S4
Music/Speech	27c040	Audio	SU5	A-5343-50025-S5
Music/Speech	27c040	Audio	SU6	A-5343-50025-S6
Music/Speech	27c040	Audio	SU7	A-5343-50025-S7

### **NOTICE**

Order replacement ROMS from your authorized Williams Electronics Games, Inc. distributor. Specify:  
(1) part number (if available); (2) ROM level (number) on label; (3) game in which ROM is used.

# PINBALL GAME ASSEMBLY INSTRUCTIONS

## **NO FEAR IS A FOUR BALL GAME**

Power: Domestic 120V @ 60Hz

Foreign 230V @ 50Hz

Japan 100V @ 50Hz

Temp: 32°F to 100° F, (0°C to 38°C)

Humidity: Not to exceed 95% relative.

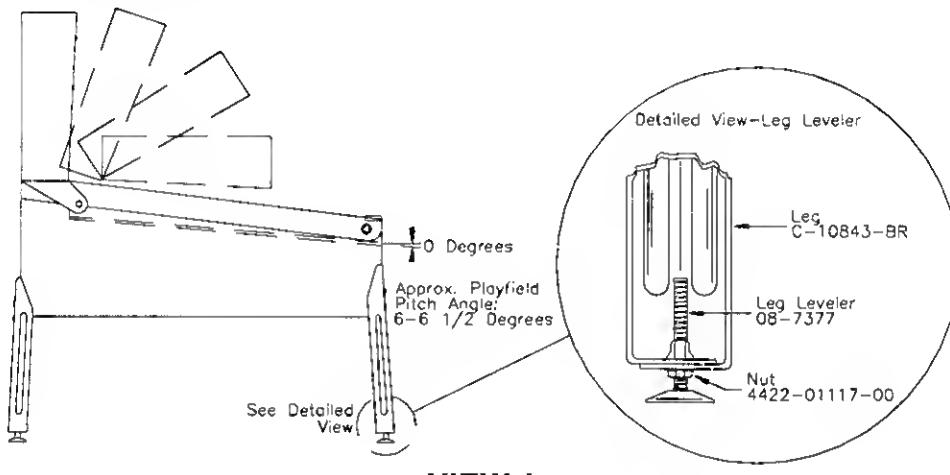
Dimensions: Width: 29" approx.

Depth: 52" approx.

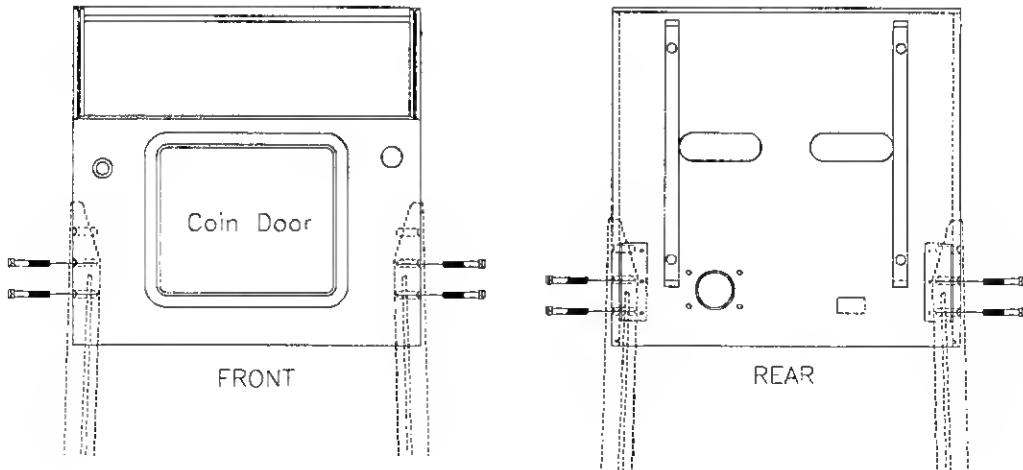
Height: 75" approx.

Weight: 325 lbs approx. (crated)

1. Remove all cartons, parts, and other items from the shipping container and set them aside.
2. Leg levelers and leg bolts are among the parts in the cash box. Install leg levelers on the front and rear legs (View 1). Place cabinet on a support and attach rear legs using leg bolts (View 2).
3. Attach front legs using leg bolts (View 2).



**VIEW 1**



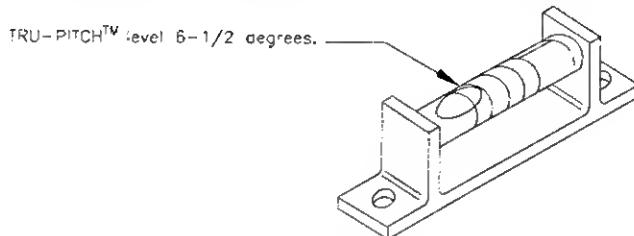
**VIEW 2**

4. Reach into the cabinet and backbox and ensure that the interconnecting cables are not kinked or pinched. Be careful to avoid damaging wires at any stage of the assembly process.
5. Raise the hinged backbox upright and latch it into position. Unlock the backbox, and remove the backglass. Remove the shipping screws holding the Insert Panel. Unlatch and open the Insert Panel. Carefully lift up the Speaker Panel and lay it down on the playfield glass. (Be careful not to damage the Dot Matrix Display/Driver.) This allows access to the bolt holes used for securing the backbox upright. To secure the backbox, install the washer-head mounting bolts through the bottom holes of the backbox into the threaded fasteners in the cabinet. Close and latch the Insert Panel. Replace the Speaker Panel. Reinstall the backglass, and lock the backbox.

## **⚠ CAUTION**

**FAILURE TO INSTALL** the backbox mounting hardware properly can cause personal injury. **NEVER TRANSPORT** a pinball game with the hinged backbox erect. Always lower the backbox forward onto the playfield cabinet on a layer of protective material to prevent marring or damage and possible personal injury.

6. Extend each leg leveler *slightly* below the leg bottom, so that all four foot pads are extended about the same distance. Remove the cabinet from its support and place it on the floor.
7. Unlock and open the coin door. Move the molding latch lever toward the left side of the game. Lift the front molding off the playfield cover glass return the latch lever toward the right, and close the coin door. Carefully slide the glass downward, until it clears the grooves of the left and right side moldings. Lift the glass up and away from the game, storing it carefully to avoid breakage.
8. Place a level or an inclinometer on the playfield surface. Adjust the leg levelers for proper playfield level (side-to-side). **Note:** This measurement must be made ON the playfield, not the cabinet nor the playfield cover glass. Tighten the nut on each leg leveler shaft to maintain this setting.
9. The TRU-PITCH™ level is located on the right shooter rail. This allows the playfield pitch angle to be properly adjusted WITHOUT REMOVING THE GLASS. The first line (closest to the front of the game) on the level is approximately 6 degrees. Every line thereafter is approximately another 1/2 degree of pitch. The recommended pitch is 6-1/2 degrees. The NOSE of the bubble should be between the first and second line on the level (see diagram below).



### **! IMPORTANT !**

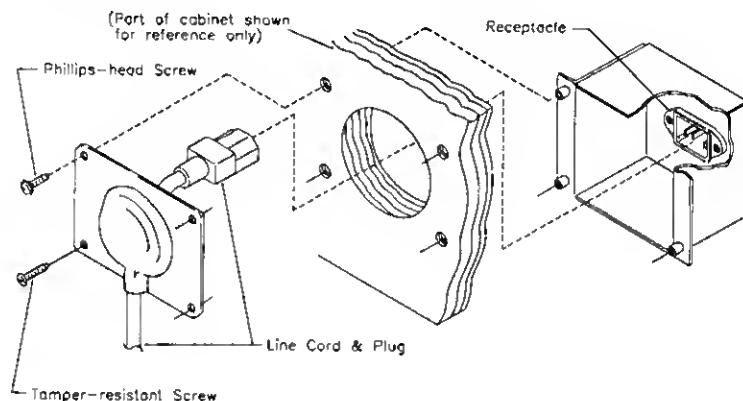
*Playfield pitch angle can affect the operation of the plumb bob tilt. The plumb bob weight is among the parts in the cash box; the operator should install the weight and adjust this tilt mechanism for proper operation, after completion of the desired playfield pitch angle setting. The unit is factory installed for a 6-1/2 degree angle. If an adjustment is necessary, loosen the screw at the bottom of the unit. Move the pointer, one groove at a time to the left or the right, depending on the degree desired. Hold the pointer in place and tighten screw*

10. Move the game into the desired location; recheck the level and pitch angle of the playfield.
11. Be sure the **required number** of balls are installed. **NO FEAR** game uses four balls.

12. Install full playfield mylar, if desired.

**NOTE:** The NO FEAR playfield is coated with a special hardcoat surface and does not require a protective mylar. However, mylars can be purchased through your local Williams Distributor. Specify part number 03-9403-1 for full playfield mylar.

13. The Ball Launch should be able to shoot the ball into the hole behind the drop target. If it doesn't, loosen the hex nut on the ball guide. Press on the ball guide in order to change its curve. Tighten the hex nut.
14. Clean and reinstall the playfield cover glass. Prepare the game for player operation.
15. To attach the line cord, remove the envelope stapled to the inside of the cabinet (near the cash box). Remove the four Phillips-head screws that mount to line cord cover plate to the rear cabinet. Match the prongs on the plug with the holes in the receptacle, and push the line cord securely into place. Make sure the cord is aligned with the indentation on the cover plate (indentation should point toward bottom of the cabinet). Remount line cord cover plate. If desired, four tamper resistant screws have been provided in an envelope marked "Security Screws" (located in the cash box) to remount cover plate.



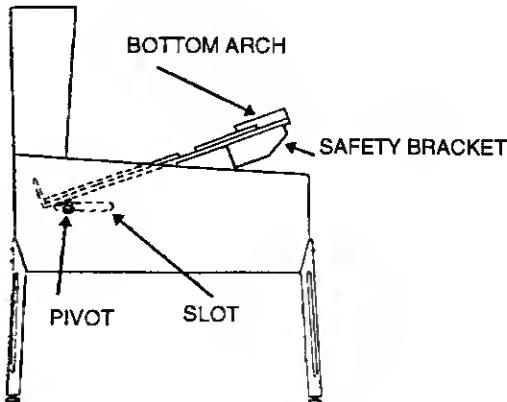
## RAISING THE PLAYFIELD

### ⚠ CAUTION

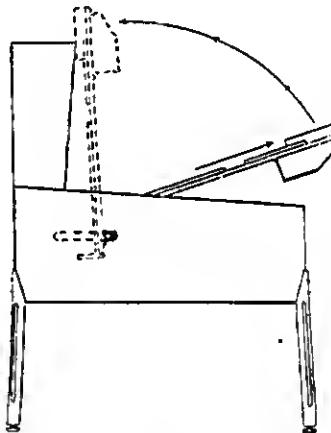
Do not raise the playfield straight up! This game uses a pivot bracket assembly to raise and lower the playfield.

#### To raise the playfield.

1. Remove all the balls from the game.
2. Grasp bottom arch and carefully lift up playfield only high enough to clear safety brackets.

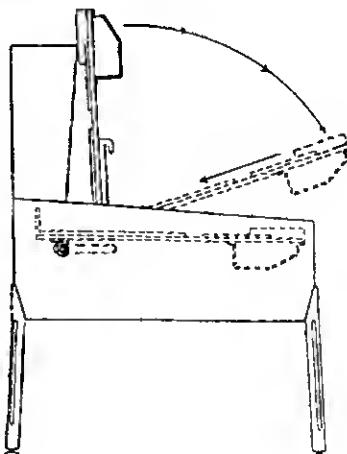


3. Pull the playfield out toward you until it stops (rest position).
4. Rotate playfield to upright service position (lean on backbox) by pulling toward you and up.



#### To lower the playfield.

5. Rotate the playfield to the rest position.
6. Push the playfield back into cabinet as far as it will go. Lower the playfield into the playing position.



# GAME CONTROL LOCATIONS

## Cabinet Switches

The On-Off Switch is on the bottom of the cabinet near the right front leg.

The Start Button is a push-button to the left of the coin door on the cabinet exterior. Press the Start button to begin a game, or during the diagnostic mode, to ask for HELP.

## Coin Door Buttons

The operator controls all game adjustments, obtains bookkeeping information, and diagnoses problems, using only four push-button switches mounted on the inside of the coin door. The coin door buttons have two modes of operation Normal Function and Test Function.

### Normal Function

The Service Credits button puts credits on the game that are not included in any of the game audits.

The Volume Up (+) button raises the sound level of the game. Press and hold the button until the desired level is reached.

The Volume Down (-) button lowers the sound level of the game. Press and hold the button until the desired level is reached. See Adjustment A.1 28 to shut sound Off completely.

The Begin Test button starts the Menu System operation and changes the coin door buttons from Normal Function to Test Function.

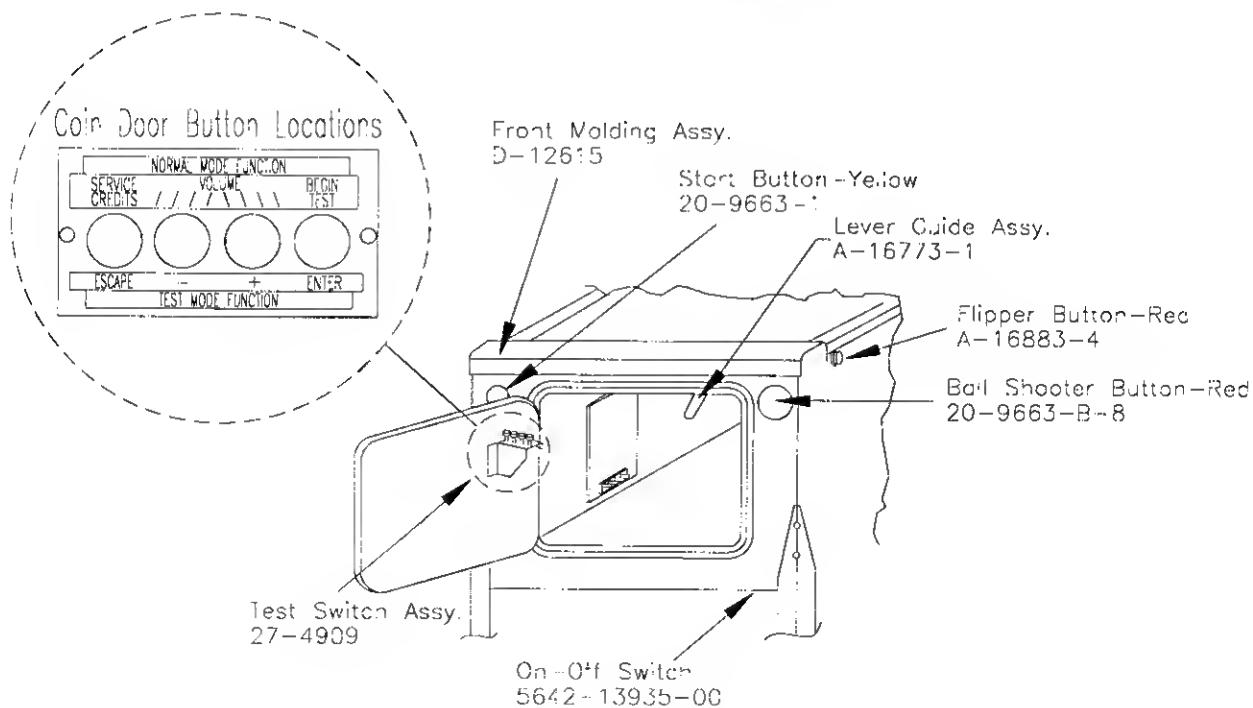
### Test Function

The Escape button allows you to get out of a menu selection or return to the Attract mode.

The Up (+) button allows you to cycle forward through the menu selections or adjustment choices.

The Down (-) button allows you to cycle backward through the menu selections or adjustment choices.

The \*Enter button allows you to get into a menu selection or lock in an adjustment choice.



*\*To reset High Score, hold down the Begin Test/Enter switch for 5 seconds while in the Attract mode.*

## GAME OPERATION

### CAUTION

After assembly and installation at its site location, this game must be plugged into a properly grounded outlet to prevent shock hazard, and to assure proper game operation. DO NOT use a 'cheater' plug to defeat the ground pin on the line cord. DO NOT cut off the ground pin.

**POWERING UP.** With the coin door closed, plug the game in, and switch it On. In normal operation, Testing shows in the displays as the game performs Start-up tests. Once the Start-up tests have been successfully completed the last score is displayed and the game goes into the Attract mode.

**Note:** After the game has been on location for a time, the Start-up tests may contain messages concerning game problems. The section entitled 'Error Messages' contains more details concerning messages displayed at each game turn-on.

Open the coin door and press the Begin Test switch. The display shows the game name, number, and software revision. The message changes. The display shows the sound software revision, the revision level of the system software, and the date the software was revised.

<b>Example:</b>	<b>NO FEAR</b>	<b>Sound Rev. L-1</b>
50025	Rev. L-X	SY. 0.X0 X-X-95

Press the Enter button to enter the WPC Menu System (refer to the section entitled "Menu System Operation" for more information). Slide the Service Switch Actuator over the top interlock switch located in the bottom left corner of the coin door opening. Perform the entire Test menu routine to verify that the game is operating satisfactorily.

**ATTRACT MODE\*.** After completing the Test menu routine, press the Escape button three times to enter the Attract mode. During the Attract mode, the score display shows a series of messages informing the player concerning, recent highest scores\*, "custom messages\*", and the score to achieve to obtain a Replay award\*.

**CREDIT POSTING.** Insert coin(s). A sound is heard for each coin, and the display shows the number of credits purchased. So long as the number of maximum allowable credits\* are NOT exceeded by coin purchase or high score, credits are posted correctly.

**STARTING A GAME.** Press the Start button. A startup sound plays, and the credit amount shown in the display decreases by one. The display flashes 00 (until the first playfield switch is actuated), and shows ball 1. If credits are posted, additional players may enter the game by pressing the Start button once for each player, before the end of play on the first ball. Press the **NO FEAR** button on the front of the cabinet to launch a ball. Press the flipper buttons to operate the flippers.

**TILTS.** Actuating the cabinet tilt switch inside the cabinet ends the current game and then proceeds to the Game Over mode. With the third closure\* of the plumb bob tilt switch, the player loses the remaining play of that ball, but can complete the game.

**END OF A GAME.** All earned scores and bonuses are awarded. If a player's final score exceeds the specified value, the player receives a designated award for achieving the current highest score. A random digit set\* appears in the display. Credits\* may be awarded, when the last two digits of any player's score match the random digits. Match, high score, and game over sounds are made.

**GAME OVER MODE.** The Game Over display shows the high scores and the game proceeds to the Attract Mode.

\* - Operator-adjustable feature

## MENU SYSTEM OPERATION

The Main Menu allows you to choose from several categories, which in turn lead to other menus to choose from. To access the Main Menu, open the coin door and press the Begin Test button, then press the Enter button. Press the Up or Down buttons to cycle through the Main Menu. Press the Enter button to access a menu. Press the Escape button to return to the Main Menu. Press the Start button for HELP at any time.

### MAIN MENU

#### B. BOOKKEEPING MENU

B.1 Main Audits	<u>Press Escape</u>
B.2 Earning Audits	To move out of a menu selection.
B.3 Standard Audits	
B.4 Feature Audits	
B.5 Histograms	<u>Press Enter</u>
B.6 Time-Stamps	To get into a menu selection.

#### P. PRINTOUTS MENU

P.1 Earnings Data	<u>Press Up</u>
P.2 Main Audits	Increases sequence; Example A.1, A.2, A.3, A.4.
P.3 Standard Audits	
P.4 Feature Audits	
P.5 Score Histograms	<u>Press Down</u>
P.6 Time Histograms	Decreases sequence; Example A.4, A.3, A.2, A.1.
P.7 Time-Stamp	
P.8 All Data	Use Up or Down to cycle through the selections in a menu.

#### T. TEST MENU

T.1 Switch Edges Test	Use Escape and Enter to move into and out of the selected menu.
T.2 Switch Levels Test	
T.3 Single Switches Test	
T.4 Solenoid Test	
T.5 Flasher Test	
T.6 General Illumination Test	
T.7 Sound and Music Test	
T.8 Single Lamp Test	
T.9 All Lamps Test	
T.10 Lamp and Flasher Test	
T.11 Display Test	
T.12 Flipper Coil Test	
T.13 Ordered Lamps Test	
T.14 Lamp Row-Col	
T.15 DIP Switch Test	
T.16 Ball Accelerator Test	
T.17 Drop Target Test	
T.18 Underground Trough Test	
T.19 Skull Test	
T.20 Empty Balls Test	

#### U. UTILITIES MENU

U.1 Clear Audits
U.2 Clear Coins
U.3 Reset H.S.T.D.
U.4 Set Time and Date
U.5 Custom Message
U.6 Set Game I.D.
U.7 Factory Adjustments
U.8 Factory Resets
U.9 Presets
U.10 Clear Credits
U.11 Auto Burn-in

#### A. ADJUSTMENT MENU

A.1 Standard Adjustments
A.2 Feature Adjustments
A.3 Pricing Adjustments
A.4 H.S.T.D. Adjustments
A.5 Printer Adjustments

Press the Up or Down buttons to cycle through the menu. Press the Enter button to access an audit menu. Press the Escape button to return to the Bookkeeping Menu.

## B. BOOKKEEPING MENU

- B.1 Main Audits**
- B.2 Earning Audits**
- B.3 Standard Audits**
- B.4 Feature Audits**
- B.5 Histograms**
- B.6 Time-Stamps**

**One Button Audit System.** The Bookkeeping Menu is obtainable directly from the Attract Mode. Repeatedly pressing the Enter button, while in the Attract Mode, will cycle through all of the game audits.

### B.1 Main Audits

B.1 01 Total Earnings	00	B.1 06 Total Plays	00
B.1 02 Recent Earnings	00	B.1 07 Replay Awards	00
B.1 03 Free Play Percent	00	B.1 08 Percent Replays	00
B.1 04 Average Ball Time	00	B.1 09 Extra Balls	00
B.1 05 Time Per Credit	00	B.1 10 Percent Extra Ball	00

### B.2 Earning Audits

B.2 01 Recent Earnings	00	B.2 08 Total Earnings*	00
B.2 02 Recent Left Slot	00	B.2 09 Total Left Slot*	00
B.2 03 Recent Center Slot	00	B.2 10 Total Center Slot*	00
B.2 04 Recent Right Slot	00	B.2 11 Total Right Slot*	00
B.2 05 Recent 4th Slot	00	B.2 12 Total 4th Slot*	00
B.2 06 Recent Paid Credits	00	B.2 13 Total Paid Credits*	00
B.2 07 Recent Service Credits	00	B.2 14 Total Service Credits*	00

\*These audits are NOT resettable. They are a record of the earnings of the game since the "CLOCK 1ST SET" Time-stamp.

### B.3 Standard Audits

B.3 01 Games Started	00	B.3 20 Average Game Time	00
B.3 02 Total Plays**	00	B.3 21 Play Time	00
B.3 03 Total Free Play	00	B.3 22 Minutes On	00
B.3 04 Free Play Percent	00	B.3 23 Balls Played	00
B.3 05 Replay Awards	00	B.3 24 Tilts	00
B.3 06 Percent Replays	00	B.3 25 Replay 1 Awards	00
B.3 07 Special Awards	00	B.3 26 Replay 2 Awards	00
B.3 08 Percent Special	00	B.3 27 Replay 3 Awards	00
B.3 09 Match Awards	00	B.3 28 Replay 4 Awards	00
B.3 10 Percent Match	00	B.3 29 1 Player Games	00
B.3 11 H.S.T.D. Credits	00	B.3 30 2 Player Games	00
B.3 12 Percent H.S.T.D.	00	B.3 31 3 Player Games	00
B.3 13 Extra Ball	00	B.3 32 4 Player Games	00
B.3 14 Percent Extra Ball	00	B.3 33 H.S.T.D. Reset Count	00
B.3 15 Tickets Awarded	00	B.3 34 Burn-in Time†	00:00:00
B.3 16 Percent Tickets	00	B.3 35 1st Replay Level	00
B.3 17 Left Drains	00	B.3 36 Left Flipper	00
B.3 18 Right Drains	00	B.3 37 Right Flipper	00
B.3 19 Average Ball Time	00		

\*\*"Total Plays" only counts on completed games. A game is considered complete when the final ball begins. Audit information from incomplete games is ignored. Operation for test and service do not affect audits.

†This Audit is not resettable.

#### B.4 Feature Audits

B.4 01	Buy-In Ex. Balls:	Number of games that use buy-in.	00
B.4 02	"Time Per Credit"	Average time per credit.	00
B.4 03	1 Buy-In Games"	1 buy in.	00
B.4 04	2 Buy-In Games	2 buy ins.	00
B.4 05	3 Buy-In Games.	3 buy ins.	00
B.4 06	> 4 Buy-In Games	4 buy ins.	00
B.4 07	Tot.M. Ball Games	Total number of main multiballs.	00
B.4 08	Ball Saves	Balls saved by Autofire during regular game.	00
B.4 09	Buy-In Ball Saves	Balls saved by Autofire during Buy-in.	00
B.4 10	Raceways	Raceway awards.	00
B.4 11	Raceway Eb Lit	Raceway Extra Balls.	00
B.4 12	Jump Shots	Jump shots (at any time).	00
B.4 13	5 Consec Jumps	Consecutive jump shots (at any time).	00
B.4 14	Summit Awards	Summit awards.	00
B.4 15	Jump This Lit	Outlanes lit to start: 'Jump This!'	00
B.4 16	Jump This Start	Jump This! started.	00
B.4 17	Kickbacks Lit	Kickbacks lit via targets.	00
B.4 18	Kickbacks Used	Kickbacks used.	00
B.4 19	Num Modes Start	Number of modes started in any way.	00
B.4 20	Dirt Started	Dirt mode started.	00
B.4 21	Dirt Awards	Dirt ramp shots.	00
B.4 22	Dirt Maxxed	Dirt mode, number of times feature has hit maximum value.	00
B.4 23	Asphalt Start	Asphalt mode started.	00
B.4 24	Asphalt Compl.	Asphalt mode finished.	00
B.4 25	Water Started	Water mode started.	00
B.4 26	Water Awards	Water mode awards (generic shots).	00
B.4 27	Water Ejects	Water eject shots (time/value increased).	00
B.4 28	Snow Started	Snow mode started.	00
B.4 29	Snow Shots	Snow mode generic shots (left ramp and summit shot).	00
B.4 30	Snow Completed	Snow mode completed (downhill shot).	00
B.4 31	Air Started	Air mode started.	00
B.4 32	Air Shots	Air mode shots made (after starting AIR).	00
B.4 33	Air Completed	Air mode completed (all shots finished).	00
B.4 34	No Limits Start	No Limits mode started.	00
B.4 35	Fear Fest Start	Fear Fest mode started.	00
B.4 36	Fear Fest Compl.	Fear Fest Mode - all challenges completed.	00
B.4 37	Meet Maker Start	Meet Your Maker mode started.	00
B.4 38	S.Cross Buildups	Supercross feature - ramp buildup shots.	00
B.4 39	Payback Start	Supercross feature - PAYBACK TIME started.	00
B.4 40	Locks Lit	Games with any Locks Lit (1 or more lit).	00
B.4 41	Locked Balls	Locked balls (total count).	00
B.4 42	Center Jackpot	Main Multiball - Center Jackpots, during Main Multiball or Last Chance of main multiball.	00
B.4 43	Drops Jackpot	Main Multiball - Drops Jackpots, during Main Multiball or Last Chance of main multiball.	00
B.4 44	Super Jackpot	Main Multiball - Super Jackpots, during Main Multiball or Last Chance of main multiball.	00
B.4 45	Random Awards	Random feature awards.	00
B.4 46	Video Mode Start	Video mode started.	00
B.4 47	Video Mode Cmpl.	Video Mode Completed.	00
B.4 48	Nascar Laps	Center loop shots - Nascar laps.	00
B.4 49	Returns Lit	Return lanes lit.	00
B.4 50	L. Hurry Up Start	Hurry Up started by the left return lane.	00
B.4 51	R. Hurry Up Start	Hurry Up started by the right return lane.	00
B.4 52	Over The Edge	Over The Edge Multiball.	00

## B.5 Histograms

B.5	01	0-1.9 Million Scores	00%	00
B.5	02	2-4.9 Million Scores	00%	00
B.5	03	5-9.9 Million Scores	00%	00
B.5	04	10-19 Million Scores	00%	00
B.5	05	20-29 Million Scores	00%	00
B.5	06	30-39 Million Scores	00%	00
B.5	07	40-49 Million Scores	00%	00
B.5	08	50-69 Million Scores	00%	00
B.5	09	70-99 Million Scores	00%	00
B.5	10	100-149 Million Scores	00%	00
B.5	11	150-199 Million Scores	00%	00
B.5	12	200-299 Million Scores	00%	00
B.5	13	Over 300 Million Scores	00%	00
B.5	14	Game Time 0.0-1.0 Mins	00%	00
B.5	15	Game Time 1.0-1.5 Mins	00%	00
B.5	16	Game Time 1.5-2.0 Mins	00%	00
B.5	17	Game Time 2.0-2.5 Mins	00%	00
B.5	18	Game Time 2.5-3.0 Mins	00%	00
B.5	19	Game Time 3.0-3.5 Mins	00%	00
B.5	20	Game Time 3.5-4.0 Mins	00%	00
B.5	21	Game Time 4-5 Mins	00%	00
B.5	22	Game Time 5-6 Mins	00%	00
B.5	23	Game Time 6-8 Mins	00%	00
B.5	24	Game Time 8-10 Mins	00%	00
B.5	25	Game Time 10-15 Mins	00%	00
B.5	26	Game Time Over 15 Mins	00%	00

## B.6 Time-Stamp

B.6	01	Current Time
B.6	02	Clock 1st Set
B.6	03	Clock Last Set
B.6	04	Audits Cleared
B.6	05	Coins Cleared
B.6	06	Factory Setting
B.6	07	Last Game Start
B.6	08	Last Replay
B.6	09	Last H.S.T.D. Reset
B.6	10	Champion Reset
B.6	11	Last Printout
B.6	12	Last Service Credit

Time-Stamp Menu allows you to view dates and times that are important to game software.

Press the Up or Down buttons to cycle through the menu. Press the Enter button to access a menu  
Press the Escape button to return to the Printouts Menu.

## **P. PRINTOUTS MENU**

(optional board required)

- P.1      Earnings Data**
- P.2      Main Audits**
- P.3      Standard Audits**
- P.4      Feature Audits**
- P.5      Score Histograms**
- P.6      Time Histograms**
- P.7      Time-Stamps**
- P.8      All Data**

The Printouts Menu is a combination of the other menus. This menu allows you to access and print information in the available menu selections.

If no printer is attached the message "Waiting for Printer" appears in the displays. **Note:** Set the print specification from the Adjustment Menu, A.5 Printer Adjustments.

*Use the Service Switch Actuator to hold in the top interlock switch located in the bottom left corner of the coin door opening. The actuator must be in place in order to activate the solenoids and flashlamps.*

Press the Up or Down buttons to cycle through the menu. Press the Enter button to access a test. Press the Escape button to return to the Test menu. **Note:** During any test, press the Start button to obtain the wire color, driver number, connector number and fuse location.

## T. TEST MENU

T.1	Switch Edges Test	T.11	Display Test
T.2	Switch Levels Test	T.12	Flipper Coil Test
T.3	Single Switch Test	T.13	Ordered Lamps Test
T.4	Solenoid Test	T.14	Lamp Row-Col
T.5	Flasher Test	T.15	DIP Switch Test
T.6	General Illumination Test	T.16	Accelerated Ball Test
T.7	Sound & Music Test	T.17	Drop Target Test
T.8	Single Lamps Test	T.18	Underground Trough Test
T.9	All Lamps Test	T.19	Skull Test
T.10	Lamps And Flasher Test	T.20	Empty Balls Test

The switch matrix, on the left side of the display, shows the state of all switches. A dot indicates the switch is open, a square indicates the switch is closed. The numbers assigned to each switch indicate where the switch is located in the matrix. The number on the left indicates the column, the number on the right indicates the row. Example - Switch 23 is 2nd column, 3rd row.

A short to ground - on either the row or column wire - appears as a shorted row(s). However, a column wire shorted to ground disappears when all of the indicated row switches are open. A row wire shorted to ground does not disappear.

A shorted diode in the switch matrix can cause other switches to appear closed. These "phantom" switches (though not actually closed), complete a rectangle in the switch matrix. Therefore, if two switches in the same column are closed (example; #22 and #24), and a third switch is pressed in another column but in the same row as one of the first two (example; #32), the "phantom" switch #34 is falsely indicated as closed. The switch with the shorted diode is diagonally opposite the "phantom" switch (in this case #22).

### **T.1 Switch Edges Test**

Press each switch one at a time. The name and number of the switch is shown in the display. If a switch other than the one pressed, or no switch at all is indicated, the system has detected a problem with the switch circuit.

### **T.2 Switch Levels Test**

This test automatically cycles through all switches that are detected closed. The name and number of each switch that is detected is shown in the display. A filled square indicates the switch's position in the matrix.

### **T.3 Single Switches Test**

The Single Switch test isolates a particular switch by blocking signals from all other switches. Use the Up or Down buttons to select the switch to be tested.

#### T.4 Solenoid Test

The Solenoid test has three modes - Repeat, Stop, and Run. Only one solenoid should pulse at a time. The system has detected a problem if more than one solenoid pulses, a solenoid comes on and stays on, or no solenoids pulse during the Repeat or Run modes.

**Repeat:** The Repeat mode pulses a single solenoid. After entering this test, solenoid one shows in the display and the corresponding solenoid activates. Press the Up or Down button to cycle through the solenoids, one at a time. The same solenoid pulses until the Up or Down button is pressed. Either press the Escape button to return to the Test menu, or press the Enter button to move to the next mode.

**Stop:** The Stop mode halts the Solenoid test. Press Enter during the Repeat mode and the Solenoid test stops. No solenoids should be activated while the test is stopped. Either press the Escape button to return to the Test menu, or the Enter button to move to the next mode.

**Run:** The Run mode cycles through the solenoids automatically. The display shows the name and number of the solenoid currently being pulsed.

#### T.5 Flasher Test

This tests the flashlamp part of the solenoid circuit exclusively. This, like the Solenoid test, has three modes - Repeat, Stop, and Run. During this test only one flashlamp circuit should pulse at a time. The system has detected a problem if more than one circuit pulses, a circuit stays on, or no circuits pulse during the Repeat or Run modes.

**Repeat:** The Repeat mode pulses a single flashlamp. After entering this test the name and number of the first flashlamp circuit shows in the display and the corresponding bulb(s) flash. Press the Up or Down buttons to cycle through all of the flashlamps circuits one at a time. The same circuit pulses until press the Up or Down button is pressed. Either press the Escape button to return to the Test menu, or press the Enter button to advance to the next mode.

**Stop:** The Stop mode halts the Flasher test. No flashlamp circuit should be active during this mode. Either press the Escape button to return to the Test menu, or press the Enter button to advance to the next mode.

**Run:** The Run mode cycles through the flashlamps automatically. The display shows the name and number of the flashlamp circuit currently being pulsed as the corresponding bulb(s) flashes.

#### T.6 General Illumination Test

This test checks all of the General Illumination circuits. There are two modes of operation - Stop and Run.

**Stop:** Press the Up or Down buttons to cycle through the General Illumination test manually. All illumination is tested first, followed by an individual circuit test. The circuit name and number shows in the display while the corresponding lamps lights. If any other results occur the system has detected an error.

**Run:** Press the Enter button any time during Stop mode and the General illumination test cycles through automatically. For each circuit shown in the display the corresponding bulbs should light. If any other results occurs the system has detected a problem.

## T.7 Sound and Music Test

The Sound and Music test checks the audio circuits. This test has three modes for testing the sound and music circuits - Run, Repeat, and Stop.

**Run:** The Run mode steps through a sequence of sounds and music. Press the Up or Down buttons during this portion of the Sound and Music test to advance to a particular sound or tune without having to wait for the program to play all the sounds available in the test. A sound or tune should be heard for each name and number that appear in the display. Any other results indicates the system has detected a problem.

**Repeat.** Press the Enter button at any time during the Run mode to cause the program to stop and repeat a particular sound/tune. The same sound should repeat continuously until the Up or Down button is pressed. Any other results indicates the system has detected a problem.

**Stop:** Press the Enter button at any time during the Repeat mode to stop this test altogether. Nothing should be heard. Any other results indicates the system has detected a problem.

## T.8 Single Lamp Test

The number assigned to each lamp indicates the lamp's position in the matrix. The number on the left indicates the column. The number on the right indicates the row. Example - Lamp 23 means 2nd column, 3rd row.

This test checks each lamp circuit individually. Press the Up or Down button to cycle through the test. For each name and number that is shown in the display the corresponding lamp should light. Any other results indicates the system has detected a problem.

## T.9 All Lamps Test

This test causes all the controlled lamps to flash at the same time. Every controlled lamp should flash. Any other results indicates the system has detected a problem.

## T.10 Lamp and Flasher Test

This test causes all the flashlamps and the controlled lamps to flash at the same time. The controlled lamps blink, while the flashlamps cycle from highest to lowest. Any other results indicates the system has detected a problem.

## T.11 Display Test

This test automatically checks every dot in the Dot Matrix Display board. A series of patterns appear in sequence. Each pattern turns on and off a section of dots. Every dot on the matrix display should be turned on and off during this test.

## T.12 Flipper Coil Test

The Flipper Coil test has three modes - Repeat, Stop, and Run. Only one flipper should pulse at a time. The system has detected a problem if more than one flipper pulses, a flipper comes on and stays on, or no flippers pulse during the Repeat or Run modes.

**Repeat:** The Repeat mode pulses a single flipper. After entering this test, flipper coil 01 shows in the display and the corresponding coil activates. Press the Up or Down button to cycle through the flipper coils, one at a time. The same solenoid pulses until the Up or Down button is pressed. Either press the Escape button to return to the Test menu, or press the Enter button to move to the next mode.

**Stop:** The Stop mode halts the Flipper Coil test. Press Enter during the Repeat mode and the test stops. No coils should be activated while the test is stopped. Either press the Escape button to return to the Test menu, or the Enter button to move to the next mode.

**Run:** The Run mode cycles through the flippers automatically. The display shows the name and number of the flipper coil currently being pulsed.

## T.13 Ordered Lamps Test

The number assigned to each lamp indicates the lamp's position in the matrix. The number on the left indicates the column. The number on the right indicates the row. Example - Lamp 23 means 2nd column, 3rd row.

This test checks each lamp circuit individually. Press the Up or Down button to cycle through the lamps. Lamps light in a clock-wise or counter clock-wise direction starting from the bottom of the playfield. Direction depends on which button, Up or Down, is pressed. For each name and number that is shown in the display the corresponding lamp should light. Any other results indicates the system has detected a problem.

## T.14 Lamp Row-Col

This test allows individual rows and columns in the lamp matrix to be operated. This is useful for trouble-shooting wiring and driver problems.

Press the Up and Down buttons to cycles through the different rows and columns.

## T.15 DIP Switch Test

This test is used to show the positions of the DIP switches on the CPU board (U27).

## T.16 Ball Accelerator Test

This tests the accelerator's ability to throw the ball up the ramp. During this test, if any of the three opto switches on the ramp (#46, #47, or #48) do not work, a message, shown on the display, will indicate the broken switch(es). *Each opto switch must be working properly for the corresponding magnet to be able to capture and throw the ball.*

While this test is active, a ball thrown up the ramp is accelerated. The display shows the state of the opto switches and the magnet coils.

### *Ball Accelerator Test Continued...*

During this test, the diagnostic test buttons on the coin door act as follows:

- Escape** - Returns to the previous menu.
- Up** - Chooses the next magnet.
- Down** - Chooses the previous magnet.
- Enter** - Activates/Deactivates the magnet for acceleration

### **T.17 Drop Target Test**

This test has three modes - Repeat, Stop, and Run. These modes allow the target to be activated while the state of the drop target's switch is shown on the display. During this test, if the drop target's switch (#51) does not work, a message, shown on the display, indicates the broken switch.

**Repeat:** The Repeat test pulses either the Drop Target Up coil or the Drop Target Down coil, until the Up or Down button is pressed to move to the next coil.

**Stop:** The drop target coils are not activated.

**Run:** The Run test cycles the Drop Target Up coil and the Drop Target Down coil automatically.

During this test, the diagnostic test buttons on the coin door act as follows:

- Escape** - Returns to the previous menu.
- Up** - During Repeat: changes to the next coil.
- Down** - During Repeat: changes to the previous coil.
- Enter** - Cycles the test between the three modes: Repeat, Stop, and Run.

### **T.18 Underground Trough Test**

This test may be used to test all of the critical switches in the trough leading from the top of the playfield (behind the drop target and under the skull) to the lower right popper. The display shows the four critical switches that are in the ball's path. During this test, if any of these switches do not work (#37, #38, #41, or #42), a message, shown on the display, indicates the broken switch(es).

The test has two modes - Automatic and Manual.

**Automatic:** The automatic operation allows a ball to be cycled through the trough automatically, with the state of each switch being displayed.

**Manual:** Manual operation will not eject balls from the right popper or the lower trough; it relies on the operator to check the switches manually and/or feed balls by hand.

During this test, the diagnostic test buttons on the coin door act as follows:

- Escape** - Returns to the previous menu.
- Up** - Does nothing.
- Down** - Does nothing.
- Enter** - Cycles the type of operation between automatic and manual.

Errors during automatic operation:

**Unable To Load Underground Trough**

This error occurs when a ball is plunged from the auto-plunger and is not seen in the underground trough.

*Underground Trough Test Continued...*

**Left Trough Entrance Not Seen**

This error occurs during the automatic test when the ball is plunged and seen by the center entrance opto, but not seen by the drop target entrance.

**Center Trough Entrance Not Seen**

This error occurs during the automatic test when the ball is plunged and seen by the left entrance opto and the right popper opto, but not seen by the center trough entrance.

**Popper Opto 2 Not Seen**

This error occurs during automatic test when the ball is plunged and seen by the center entrance opto and the right popper 1 opto, but not seen by the right popper 2 opto.

**Popper Opto 1 Not Seen**

This error occurs during automatic test when the ball is plunged and seen by the center entrance opto and the right popper 2 opto, but not seen by the right popper 1 opto after several seconds.

**T.19 Skull Test**

This test exercises the skull by cycling through several speech calls.

**T.20 Empty Balls**

This test kicks out all balls loaded in troughs, lockups, poppers, and kickouts until no balls remain in those locations.

*Note - As balls roll down the playfield and into the outhole, they will be continually kicked out of the trough.*

Press the Up or Down buttons to cycle through the menu. Press the Enter button to access a utility. Press the Up or Down buttons to see the setting choices. Press the Enter button to lock in a choice. If a mistake is made, press Escape while "Saving Adjustment Value" is in the display. The original setting is retained and the new setting is ignored. Press the Escape button to return to the Utility menu.

## **U. Utilities Menu**

- U.1 Clear Audits**
- U.2 Clear Coins**
- U.3 Reset H.S.T.D.**
- U.4 Set Time & Date**
- U.5 Custom Message**
- U.6 Set Game I.D.**
- U.7 Factory Adjustments**
- U.8 Factory Resets**
- U.9 Presets**
- U.10 Clear Credits**
- U.11 Auto Burn-in**

### **U.1 Clear Audits**

Press the Enter button to clear the Standard Audits (except Burn-in Time), Feature Audits, and Histograms.

### **U.2 Clear Coins**

Press the Enter button to clear the Earnings Audits.

### **U.3 Reset H.S.T.D.**

Press the Enter button to clear the High Score to Date Table and the Grand Champion.

### **U.4 Set Time and Date**

Press the Enter button to activate the time and date. Use the Up or Down button to change the value, then press the Enter button to lock in that value. If a mistake is made press the Escape button while "Saving Adjustment Value" is displayed. The new value is ignored and the original value is retained.

### **U.5 Custom Message**

*Set A.1 20 to ON before trying to write a Custom Message.* Press the Enter button to begin entry of the custom message. Use the Up or Down buttons to cycle through letters. Use the Start button to cycle through punctuation marks. Press the Enter button to lock in the desired letter and punctuation. If a mistake is made, use Up and Down to select the "back-arrow" character. The "back-arrow" character is located before the space character and after the number nine. Press Enter while the back-arrow shows to erase the previously entered character. Once the message is complete, press and hold the Enter button until "Message Stored" is displayed.

Press the Escape button to cancel the new message. The message "Press Enter to Reset" appears. If Enter is pressed, the custom message is cleared and no message is displayed. If Escape is pressed, the original message remains intact.

### **U.6 Set Game I.D.**

This utility allows for the installation of a message, such as game location, that only appears on printouts. Press the Enter button to activate Set Game I.D.. Use the Up or Down buttons to cycle through letters. Use the Start button to cycle through punctuation marks. Press the Enter button to lock in the desired letter and punctuation.

## **U.7 Factory Adjustment**

Press the Enter button to restore the adjustments to factory settings.

## **U.8 Factory Reset**

Press the Enter button to restore the adjustments to their factory setting, clear the Audits, H.S.T.D Table, and Custom Message/Game I.D.

## **U.9 Presets**

Use the Up or Down buttons to cycle through the available Presets. When the desired Preset is displayed, press the Enter button to lock in that Preset. If a mistake is made, press the Escape button while "Saving Adjustment Value" is displayed. The new value is ignored and the original value is retained.

**Game Difficulty Levels** The game play difficulty adjustments can be changed to a combination that is MUCH LESS to MUCH MORE difficult than Factory Settings. The Game Difficulty Setting Table lists the adjustments and settings that comprise the individual group.

<b>U.9 01 Install Extra Easy</b>	MUCH LESS difficult than factory setting
<b>U.9 02 Install Easy</b>	Somewhat LESS difficult than factory setting.
<b>U.9 03 Install Medium</b>	About the SAME as factory setting.
<b>U.9 04 Install Hard</b>	Somewhat MORE difficult than factory setting
<b>U.9 05 Install Extra Hard</b>	MUCH MORE difficult than factory setting.

**Difficulty Setting Table for U.S. and Canadian Games**

Adj. #	Adj. Description	Extra Easy U.9 01	Easy U.9 02	Medium U.9 03 (factory)	Hard U.9 04	Extra Hard U.9 05
A.2 06	Kickback Memory	EASY	MEDIUM	MEDIUM	HARD	EX. HARD
A.2 07	Kickback Relight	EASY	EASY	EASY	HARD	HARD
A.2 08	Raceway Holdover	EASY	EASY	EASY	HARD	HARD
A.2 09	Raceway Ex. Ball Memory	YES	YES	YES	YES	NO
A.2 10	First Raceway	2	1	AUTO	0	0
A.2 11	Cliff Award At	3	4	4	6	8
A.2 12	Cliff Memory	YES	YES	YES	YES	YES
A.2 13	First Payback	BOTH	BOTH	BOTH	BOTH	RIGHT
A.2 14	Payback Memory	YES	YES	YES	NO	NO
A.2 15	Lock Difficulty	EASY	EASY	EASY	MEDIUM	HARD

**Difficulty Setting Table for German and European Games**

Adj. #	Adj. Description	Extra Easy U.9 01	Easy U.9 02	Medium U.9 03 (factory)	Hard U.9 04	Extra Hard U.9 05
A.2 04	Ball Saves Time	4	4	4	4	4
A.2 06	Kickback Memory	EASY	MEDIUM	MEDIUM	HARD	EX. HARD
A.2 07	Kickback Relight	EASY	EASY	EASY	HARD	HARD
A.2 08	Raceway Holdover	EASY	EASY	EASY	HARD	HARD
A.2 09	Raceway Ex. Ball Memory	YES	YES	YES	YES	NO
A.2 10	First Raceway	2	1	AUTO	0	0
A.2 11	Cliff Award At	3	4	4	6	8
A.2 12	Cliff Memory	YES	YES	YES	YES	YES
A.2 13	First Payback	BOTH	BOTH	BOTH	BOTH	RIGHT
A.2 14	Payback Memory	YES	YES	YES	NO	NO
A.2 15	Lock Difficulty	EASY	EASY	EASY	MEDIUM	HARD

**Difficulty Setting Table for French Games**

Adj. #	Adj. Description	Extra Easy U.9 01	Easy U.9 02	Medium U.9 03 (factory)	Hard U.9 04	Extra Hard U.9 05
A.2 04	Ball Saves Time	4	4	4	4	4
A.2 05	Timed Plunger	30 SEC.	30 SEC.	30 SEC.	30 SEC.	30 SEC.
A.2 06	Kickback Memory	EASY	MEDIUM	MEDIUM	HARD	EX. HARD
A.2 07	Kickback Relight	EASY	EASY	EASY	HARD	HARD
A.2 08	Raceway Holdover	EASY	EASY	EASY	HARD	HARD
A.2 09	Raceway Ex. Ball Memory	YES	YES	YES	YES	NO
A.2 10	First Raceway	2	1	AUTO	0	0
A.2 11	Cliff Award At	3	4	4	6	8
A.2 12	Cliff Memory	YES	YES	YES	YES	YES
A.2 13	First Payback	BOTH	BOTH	BOTH	BOTH	RIGHT
A.2 14	Payback Memory	YES	YES	YES	NO	NO
A.2 15	Lock Difficulty	EASY	EASY	EASY	MEDIUM	HARD

**U.9 06 Install 5 Ball**

**U.9 07 Install 3 Ball**

Adjustments U.9 06 and U.9 07 can be used to change a game to 3 or 5 ball play, including changing of certain features to the recommended 3-and 5-ball level. The Preset Game Adjustments Table for U.S./Canadian Games lists the adjustments and settings that comprise the individual groups.

**Preset Adjustments Table for U.S. and Canadian Games**

Adj. #	Adj. Description	Install 5-ball U.9 06	Install 3-ball U.9 07
A.1 07	Replay Start	1.4 BILLION	800 MILLION
A.2 04	Ball Save Time	4 SECONDS	6 SECONDS
A.2 10	First Raceway	0	AUTO
A.2 11	Cliff Award At	6	4
A.2 15	Lock Difficulty	MEDIUM	EASY

**U.9 08 Install Add-A-Ball**

This option deletes all Free Play awards and replaces them with Extra Ball awards. Individual adjustments are affected, as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
A.1 13	Replay Boost	Off
A.1 14	Replay Award	Ex. Ball
A.1 17	Extra Ball Ticket	No
A.1 19	Match Feature	Off
A.4 04	Champion Credits	00
A.4 05	High Score 1 Credits	00
A.4 06	High Score 2 Credits	00
A.4 07	High Score 3 Credits	00
A.4 08	High Score 4 Credits	00

#### **U.9 09 Install Ticket**

This option deletes Credit awards and replaces them with Ticket awards. Individual adjustments are affected as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
A.1 14	Replay Award	Ticket
A.1 16	Match Award	Ticket
A.1 17	Ex. Ball Ticket	Yes
A.1 31	Ticket Expan.Brd.	Yes
A.4 02	H.S.T.D. Award Ticket	Yes

#### **U.9 10 Install Novelty**

This option removes all Free Play and Extra Ball awards. Individual adjustments are affected as follows:

<u>Ad</u>	<u>Name</u>	<u>New Setting</u>
A.1 04	Max. Ex. Ball	Off
A.1 05	Replay System	Fixed
A.1 09	Replay Level 1	Off
A.1 10	Replay Level 2	Off
A.1 11	Replay Level 3	Off
A.1 12	Replay Level 4	Off
A.1 19	Match Feature	Off
A.4 01	Highest Score	On
A.4 04	Champion Credits	00
A.4 05	High Score 1 Credits	00
A.4 06	High Score 2 Credits	00
A.4 07	High Score 3 Credits	00
A.4 08	High Score 4 Credits	00

#### **U.9 11 NOT USED**

#### **U.9 12 Serial Capture**

This sets up the printer adjustments for a serial transmission to a laptop computer, (9600 baud, 40 column, no page breaks, serial printer). This option requires the installation of the optional printer kit; part number 63110.

#### **U.9 13 to U.9 16 NOT USED**

- U.9 17 Install German 1 •**
- U.9 18 Install German 2 •**
- U.9 19 Install German 3 •**
- U.9 20 Install German 4 •**
- U.9 21 Install German 5 •**
- U.9 22 Install German 6 •**

Adjustments U.9 17 through U.9 22 are used to modify game pricing and type of game play. The Preset Game Adjustments Table for German/European Games lists the adjustments and settings that comprise the individual groups. **NOTE:** German replay starts at 500,000,000.

### Preset Adjustments Table for German Games

Adj #	Adj Description	German 1 U.9 17	German 2 U.9 18	German 3 U.9 19	German 4 U.9 20	German 5 U.9 21	German 6 U.9 22
A.1 14	Replay Award	Credit	Ticket	Audit	Credit	Ticket	Audit
A.1 15	Special Award	Credit	Ex. Ball	Points	Credit	Ex. Ball	Points
A.1 16	Match Award	Credit	Ticket	Credit	Credit	Ticket	Credit
A.1 19	Match Feature	7%	7%	Off	7%	7%	Off
A.3 01	Game Pricing	6spiele/5DM	6spiele/5DM	6spiele/5DM	7spiele/5DM	7spiele/5DM	7spiele/5DM
A.4 02	H.S.T.D. Award	Credit	Ticket	Credit	Credit	Ticket	Credit
A.4 04	Champion Credits	03	03	00	03	03	00
A.4 05	H.S.T.D. 1 Credits	01	01	00	01	01	00
A.4 06	H.S.T.D. 2 Credits	00	00	00	00	00	00
A.4 07	H.S.T.D. 3 Credits	00	00	00	00	00	00
A.4 08	H.S.T.D. 4 Credits	00	00	00	00	00	00

• German DIP Switch settings are:

Sw4	Sw5	Sw6	Sw7	Sw8
On	On	On	On	Off

**U.9 23 Install French 1\***

**U.9 24 Install French 2\***

**U.9 25 Install French 3\***

**U.9 26 Install French 4\***

**U.9 27 Install French 5\***

**U.9 28 Install French 6\***

Adjustments U.9 23 through U.9 28 are used to modify game pricing and type of play.

\* French DIP Switch settings are:

Sw4	Sw5	Sw6	Sw7	Sw8
On	On	On	Off	Off

#### **U.10 Clear Credits**

Press the Enter button to clear the game Credits.

#### **U.11 Auto Burn-in**

Press the Enter button to activate Auto Burn-in. This utility automatically cycles through several tests. This helps in finding intermittent problems. The tests that Auto Burn-in cycles through are: the Display Test, the Sound and Music Test, the All Lamps Test, the Solenoid Test, the Flashers Test, the General Illumination Test, and the Flipper Coil Test. All of the test run are run concurrently. The time spent on the burn-in cycle, and the total time the game has spent in burn-in are displayed.

Press the Up or Down buttons to cycle through the menu. Press the Enter button to access an adjustment. Press the Up or Down buttons to see the setting choices. Press the Enter button to lock in a setting choice. If a mistake is made, press the Escape button while "Saving Adjustment Value" is in the display. The original value is retained and the new value is ignored. Press the Escape button to return to the Adjustment Menu.

## **A. ADJUSTMENTS MENU**

- A.1 Standard Adjustments**
- A.2 Feature Adjustments**
- A.3 Pricing Adjustments**
- A.4 H.S.T.D Adjustments**
- A.5 Printer Adjustments** (optional board required)

### **A.1 Standard Adjustments**

#### **A.1 01 Balls Per Game**

A "game" is defined by specifying the number of balls to be played.

Range: 1 to 10.

#### **A.1 02 Tilt Warnings**

The number of total actuations of the plumb bob that can occur before the game is "tilted".

Range: 1 to 10.

#### **A.1 03 Maximum Extra Balls**

The number of Extra Balls that a player may accumulate.

Range: 0 to 10.

#### **A.1 04 Maximum Extra Balls/Ball in Play**

The number of Extra Balls to be awarded per ball in play.

OFF - No maximum number of Extra Ball per ball in play.

1-10 - 1 through 10 Extra Balls per ball in play.

#### **A.1 05 Replay System**

The type of replay system to be used.

Fixed - Replay value is set and does not change during game play.

Auto% - Replay starting value is set but changes every 50 games to comply with the percentage of replays desired.

#### **A.1 06 Replay Percent\***

The percentage of replays the players are able to earn when Auto Replay is used.

Range: 5% to 50%.

#### **A.1 07 Replay Start\***

Replay start value when Auto% Replay is used.

Range: 15,000,000 to 250,000,000.

\*For Auto% Replay.

**A.1 08 Replay Levels\***

The number of replay levels used by the Auto% Replay mode. The range of this setting is 1 to 4. When two replay levels are chosen, the second replay level is automatically adjusted to twice the starting replay level. When three or four replay levels are chosen, their values are automatically adjusted to three or four times the starting replay level.

**A.1 09 Replay Level 1\*\*****A.1 10 Replay Level 2\*\*****A.1 11 Replay Level 3\*\*****A.1 12 Replay Level 4\*\***

The value to be used for the 1st through 4th Fixed Replay.

Range: 00 to 250,000,000.

**A.1 13 Replay Boost**

The replay score can be temporarily boosted by the selected amount EACH time the player reaches or exceeds the replay score. This temporary boost is canceled when credits equal 0, the player inserts another coin, or when Begin Test is pressed.

ON - Score is boosted between 500,000 and 5,000,000 points.

OFF - Replay score is not boosted.

**A.1 14 Replay Award**

The form of award automatically provided when the player exceeds any replay level for either Auto% Replay or Fixed Replay.

Credit - Reaching each Replay level awards credit.

Ticket - Reaching each Replay level awards a ticket.

Ball - Reaching each Replay level awards an Extra Ball.

Audit - Reaching each Replay level awards nothing to the player; it does increase the entry value of the Audit Item(s) maintaining a tally of these awards.

**A.1 15 NOT USED****A.1 16 Match Award**

The award automatically provided when the players wins a match.

Credit - Winning a Match awards a Credit.

Ticket - Winning a Match awards a Ticket.

**A.1 17 Extra Ball Ticket**

A Ticket is awarded when the player earns an Extra Ball.

YES - The player is awarded a Ticket in addition to an Extra Ball.

NO - The player is not awarded a Ticket

\*For Auto% Replay; \*\* For Fixed Replay

**A.1 18 Maximum Ticket/Player**

The amount of Tickets each player can earn.

Range: 00 to 100.

**A.1 19 Match Feature**

The desired percentage for the Match Feature occurring at the end of the game.

OFF - Match Feature is not available.

1 - 50% - 1% is 'hard'; 50% is 'extremely easy'. The Match Feature selects a random two-digit number at the end of the game and compares each players score for an identical two digits in the rightmost two positions. A match of these two digit results in an award of a Credit or a Ticket.

**A.1 20 Custom Message**

The message displayed during the Attract Mode.

YES - A message is displayed

NO - A message is not displayed.

**A.1 21 Language**

The language the game uses: English, French, or German.

**A.1 22 Clock Style**

The style of clock the game uses: A.M./P.M. or 24 Hours.

**A.1 23 Date Style**

The style of date the game uses: Month/Date/Year, or Date/Month/Year.

**A.1 24 Show Date and Time**

The date and time show in the Attract Mode.

YES - Show the date, time in status report or in the Attract Mode.

NO - Do Not show date, time in status report or in the Attract Mode.

**A.1 25 Allow Dim Illumination**

The game program dims the General Illumination for special effects and during the Attract Mode.

YES - Dim the General Illumination during the Attract Mode.

NO - Do Not dim the General Illumination.

**A.1 26 Tournament Play**

Equalize Multiball and Jackpots during multi-player games, (do not carry over to next player).

YES - Keep Multiball and Jackpots equal.

NO - Do Not Keep Multiball and Jackpots equal.

**A.1 27 Euro. Scr. Format**

Use either commas or dots between digits when numbers are displayed.

- YES - Dots instead of commas, (example- 1.000.000).  
NO - Commas instead of dots, (example- 1, 000, 000).

**A.1 28 Minimum Volume Override**

The volume can be turned Off.

- YES - Volume can be turned Off.  
NO - Volume can be turned Down but not Off.

**A.1 29 General Illumination Power Saver**

This allows the general illumination and controlled lamps to be dimmed following a time interval after a game is played. Power Saver Level (A.1 30) determines dimness of the lamps. Using this feature substantially increases the life of the lamps.

Setting: OFF, 2 to 60 minutes.

**A.1 30 Power Saver Level**

When General Illumination Power Saver (A.1 29) is set to On, this controls the intensity of the G.I. and controlled lamps once the game has been idle for a specified period of time.

Range: 4 to 7. (4 = dimmest, 7 = brightest)

**A.1 31 Ticket Expansion Board**

When a Ticket Expansion Board is connected, full control of the ticket dispenser is available. This includes a ticket low/error lamp, resume on ticket jam switch and manual ticket dispense switch.

- YES - Ticket Expansion Board is connected.  
NO - Ticket Expansion Board is NOT installed in the game.

**A.1 32 No Bonus Flips**

The activation of flippers during the end of ball "bonus" sequence. Setting to "YES" may extend the life of the flipper mechanisms.

**A.1 33 Game Restart**

When the Start button is pressed during or after the 2nd ball, the game in progress will end and a new game will begin. This adjustment has three settings to determine how this is handled.

- NEVER - Do not allow a new game start until the current game is over.  
SLOW - Restart if the Start button is pressed continuously for over 1/2 second. This helps to prevent the unintended restart of game in progress.  
INSTANTLY - Restart as soon as the Start button is pressed.

When the Start button is pressed during game over, or during the 1st ball (to add a player), it is always handled instantly.

## **A.2 Feature Adjustments**

### **A.2 01 Buy Extra Ball**

This determines whether the player may buy an Extra Ball.

Choices are: OFF, 1/2 CREDIT, 1 CREDIT

Factory Default: 1 CREDIT

### **A.2 02 Buy-in Count**

This determines how many times a player may buy an Extra Ball.

Choices are: 1, 2, 3, UNLIMITED

Factory Default: 3

### **A.2 03 Ball Saves**

Number of ball saves the player gets.

Choices are: OFF, 1 to 5

Factory Default: 1

### **A.2 04 Ball Save Time**

This sets the time (seconds) for the ball saver.

Choices are: 3 to 15 SECONDS

Factory Default: 6 SECONDS

### **A.2 05 Timed Plunger**

This is the number of seconds before automatically plunging a ball that is sitting on the plunger lane.

Choices are: OFF, 30 to 90 SECONDS

Factory Default: OFF

### **A.2 06 Kickback Memory**

Determines if kickback is lit on first ball and if it is carried from ball to ball.

Choices are: MEDIUM - On first ball, no carry.

EASY - On every ball.

HARD - Off first ball, carry from ball to ball.

EXTRA HARD - Off every ball.

Factory Default: MEDIUM - On first ball, no carry.

### **A.2 07 Kickback Re-light**

Kickback targets - build up or only light themselves.

Choices are: EASY - Either target lights a light in the cliff.

HARD - Cliff targets only light their respective light.

Factory Default: EASY - Either target lights a light in the cliff.

**A.2 08 Raceway Holdover**

Raceway feature - hold level from ball to ball.

Choices are: EASY - Hold ball to ball until extra ball earned.

HARD - Cleared at each ball start speedways.

Factory Default: HARD

**A.2 09 Raceway E.B. Mem.**

Raceway extra ball - hold over from ball to ball.

Choices are: YES, NO

Factory Default: YES

**A.2 10 First Raceway**

Number of raceways spotted for the first raceway. Subsequent Raceway awards will start with zero raceways spotted.

Choices are: 0, 1, 2, AUTO. If set to AUTO, it will attempt to adjust to percentage the Extra Ball.

Factory Default: AUTO

**A.2 11 Cliff Award At**

First threshold for the cliff feature. (Number of Hundred "meters").

Choices are: 2 to 10

Factory Default: 4

**A.2 12 Cliff Memory**

Cliff feature - hold level from ball to ball.

Choices are: YES, NO

Factory Default: YES

**A.2 13 First Payback**

Which ramp shot(s) start payback buildup each ball start.

Choices are: LEFT - Player must shoot left ramp before right ramp.

RIGHT - Player must shoot right ramp before left ramp.

BOTH - Player may shoot either ramp to start payback buildup.

Factory Default: BOTH

**A.2 14 Payback Memory**

Payback build up shots carry from ball to ball. After the first PAYBACK TIME is played, the build up will not from ball to ball.

Choices are: YES, NO

Factory Default: YES

**A.2 15 Lock Difficulty**

Lock sequence difficulty. This governs how hard it is for the player to light the locks and where they are lit. This adjustment applies to the first multiball sequence. Subsequent multiball sequences progress to the HARD setting.

Choices are: EASY - All 3 locks lit via 1 drop target, BOTH LOCKS LIT.  
MEDIUM - Takes 1 drop target hit/lock, BOTH LOCKS LIT.  
HARD - Takes 1 drop target hit/lock, only CENTER LOCK LIT.

Factory Default: EASY

**A.2 16 Inst. Speech**

When this is set, instructional speech will be said.

Choices are: YES, NO  
Factory Default: YES

**A.2 17 A-Mode Music**

Attract mode music and speech.

Choices are: YES, NO  
Factory Default: NO

**A.2 18 Staged Ball**

This tells the game to keep a ball at the right popper to eject when balls enter the underground trough. This speeds up ball delivery to the player.

Choices are: YES, NO  
Factory Default: YES

**A.2 19 Flipper Plunger**

When this is set, we plunge the ball with the flipper buttons.

Choices are: YES, NO  
Factory Default: NO

**A.2 20 Disable Jaw**

When set to YES this disables skull jaw movement

Choices are: YES, NO  
Factory Default: NO

### **A.3 Pricing Adjustments**

#### **A.3 01 Game Pricing (If set to custom, then 02 to 09 are available. Custom Pricing Is Not Available For U.S.A. And Canadian Games).**

The cost of a game is selected here from the Standard Pricing Table or by using the custom pricing editor (A.3 27).

#### **A.3 02 to A.2 09      NOT USED**

#### **A.3 10 Coin Door Type (If set to custom, then 11 to 15, 20 and 25 are available. Custom Pricing Is Not Available For U.S.A. And Canadian Games).**

This adjustment is used to preset adjustments 11 through 15, 20 and 25, based on standard coin doors.

#### **A.3 11 Collection Text**

The coin system is used to display the Earning Audits.

#### **A.3 12 Left Slot Value**

#### **A.3 13 Center Slot Value**

#### **A.3 14 Right Slot Value**

#### **A.3 15 4th Slot Value**

The monetary value of the left, center, right and 4th coin chutes. Formerly these values only affected the way in which the coins were totaled for auditing displays. In the new 10/94 pricing system, these values are added for each coin inserted and credits are awarded based on the amount of money accumulated. See Pricing Editor (A.3 27) for more information.

#### **A.3 16 Maximum Credits**

The maximum number of credits the game can accumulate, either through game play awards or coin purchases. The range of this setting is 5 through 99. Reaching the specified setting prevents the award of any credits. Factory default is 10.

#### **A.3 17 Free Play**

A player can operate the game without a coin (free play) or with a coin.

NO - A coin is necessary for game play.

YES - Game play is free; no coin required.

#### **A.3 18 Hide Coin Audits**

The coin audits may, or may not, be displayed.

YES - The coin audits are not displayed.

NO - The coin audits are displayed.

HIDE NAMES - The coin audit value is shown but not the audit name.

#### **A.3 19 NOT USED**

#### **A.3 20 Base Coin Size**

This is the smallest unit of coin that may be used when creating a custom pricing mode using the Pricing Editor (A.3 27). For example, in the USA this is typically \$0.25. All pricing levels are then specified in 25 cents (or greater) increments.

### A.3 21 Coin Meter Units

It is possible to connect a coin meter to the knocker coil driver which will log all coins through all slots. This adjustment activates the use of the knocker driver for this purpose, and determines the value of each unit on the meter. For example, to show the total amount of money collected as "total quarters", set this adjustment to "0.25". To show the amount of money collected as "total dollars", set this adjustment to "1.00". **Setting this adjustment to anything other than Off establishes the coin unit for a meter attached to the knocker driver, and overrides use of the knocker during awards.**

### A.3 22 Dollar Bill Slot

The system normally requires 150 microseconds between coin pulses. This is too long a delay for a fast-pulsing dollar bill validator. This adjustment may be used to tell the game that there is a fast-pulsing dollar bill validator connected to one of the coin switches.

NONE = No validator connected.  
LEFT = Validator connected to left slot.  
CENTER = Validator connected to center slot.  
RIGHT = Validator connected to right slot  
FOURTH = Validator connected to fourth.

### A.3 23 Minimum Coin Microseconds

This is the minimum width required for coin pulses to be accepted as valid coins. This may be changed to prevent certain kinds of cheating.

### A.3 24 NOT USED

### A.3 25 Allow Hundredths

This is used for a custom door specifier. If set to "YES", then the values for A.3 12-15 are specified in units and hundredths (such as dollars and quarters). If set to "NO", then all values are in units (such as Francs and Lire.)

### A.3 26 Credit Fraction

This determines the smallest fraction used for credits. It must be even to accommodate the extra ball buy-in option of 1/2 credit, and is typically 1/2 but may need to be a different value for modes requiring more coins per credit.

### A.3 27 Pricing Editor (Custom Pricing Is Not Available For U.S.A. And Canadian Games).

This function is now used to enter information for a custom pricing mode. The adjustment A.3 26 (Credit Fraction) may need to be set before entering the custom pricing editor. This specifies the smallest fraction available for partial credits.

Because of availability of an extra ball (buy-in) for 1/2 credit, this value is always even (1/2, 1/4, 1/6 etc.). The typical setting for A.3 26 is 1/2 (such that there are only full credits and half credits) but you may need to use a different value for other pricing modes.

Please note that formerly, the coin values specified by custom coin doors adjustments A.3 12-15 only affected audit totals that showed collection totals. In the 10/94 pricing system, these coin values are added up for each coin received and credits are awarded based on pricing levels being reached. The pricing editor described here allows you to set these levels, however it may be necessary for you to set A.3 10 (Coin Door Type) to "CUSTOM" and then change A.3 11-15, 20 and 25 to reflect the value of the coins being used. This is usually NOT NECESSARY, but must be done BEFORE using the custom pricing editor when it is necessary.

Begin the custom pricing function by pressing the "Enter" button while A.3 27 "Pricing Editor" is showing in the display.

The pricing editor will now show the data for the currently selected pricing mode. If this is the 1st use of the pricing editor then this will show the last built-in pricing that was selected. Otherwise it will be the last custom mode created by this function. (Note that A.3 01 will display "Custom" any time a non-standard pricing has been selected.)

Assuming the last mode installed was 1/\$0.50 2/\$0.75 3/\$1.00 the display appears as follows:

CUSTOM PRICING EDITOR		
1)	\$0.25	1/2 cred.
2)	\$0.50	1 cred.
3)	\$0.75	2 cred.
4)	\$1.00	3 cred.

DISPLAY VIEW

The "\$0.25" field will be flashing. You may now use the test mode buttons to perform the following functions:

- Escape:* Undo any changes to the current field and move to the previous field.
- "-" (Down):* Make the current field lower.
- "+" (Up):* Make the current field higher.
- Enter:* Save any changes to the current field and move to the next field. Note that there are 2 columns of fields. Price levels are in the left column and credit levels are in the right column. Pressing "Enter" will move from left column to right column before moving to the next line.
- Start:* Save the current price mode or start over

By using the above functions, you simply enumerate each pricing level and the number of credits that should be awarded at that level. Please note that you must specify each fractional level in sequence.

Example:

1/\$0.50	2/\$1.00	4/\$1.50	6/\$2.00
1)	\$0.25	1/2 cred.	
2)	\$0.50	1 cred.	
3)	\$0.75	1 1/2 cred.	
4)	\$1.00	2 cred.	
5)	\$1.25	2 1/2 cred.	
6)	\$1.50	4 cred.	
7)	\$1.75	4 1/2 cred.	
8)	\$2.00	6 cred.	

Also note that once the value of the coins repeat that no further specification is necessary.

Example:

1/\$0.50      2/\$1.00

1)      \$0.25      1/2 cred.

In the above example, only one line needs to be specified, indicating that 1/2 credit is awarded for each \$0.25 received.

**Special Features:**

There are some special features available by pressing the “-” (Down) button while in the left column. The following words will be displayed instead of a pricing level:

*End*  
*Delete*  
*Insert*  
*Clear*  
*Repeat 1*  
*Repeat 2*  
*Repeat 3*  
*Repeat 4*  
*Repeat 5*  
*Repeat 6*  
*Repeat 7*  
*Repeat 8*  
*Repeat 9*  
*Repeat 10*  
*Repeat 11*  
*Repeat 12*  
*Repeat 13*  
*Repeat 14*  
*Repeat 15*  
*Repeat 16*  
*Repeat 17*  
*Repeat 18*  
*Repeat 19*  
*Repeat 20*

Pressing “Enter” with the above words selected will activate the following instructions:

**End**      This is the same as pressing the Start button. A menu of choices will be provided (see “Start Button” below).

**Delete**      This will delete the current level from the pricing mode.

**Insert**      This will insert a new pricing level ABOVE the current level. The current level will be unaffected. There must be room for at least 1 coin between the current level and the previous level, and at least one fractional credit unit between the current level and the previous level.

Example: Inserting a new pricing level.

CUSTOM PRICING EDITOR		
1)	\$0.50	1 cred.
2)	\$1.00	2 cred.
3)	\$1.50	4 cred.
4)	\$2.00	6 cred

DISPLAY VIEW

Use the "Enter" button to move to the \$1.50 field. Now press the "-" button once to create the following display:

CUSTOM PRICING EDITOR		
1)	\$0.50	1 cred.
2)	\$1.00	2 cred.
3)	INSERT	4 cred.
4)	\$2.00	6 cred

DISPLAY VIEW

Now press the "Enter" button. The display will now show:

CUSTOM PRICING EDITOR		
1)	\$0.50	1 cred.
2)	\$1.00	2 cred.
3)	\$1.25	2 1/2 cred.
4)	\$2.00	6 cred

DISPLAY VIEW

Note that the line "5) \$2.00 6 cred." no longer fits on the display. Whenever there are more than four pricing levels that the display will scroll up and down as "Enter" and "Escape" are used to move from field to field. If you repeatedly press "Enter" the display will then show:

CUSTOM PRICING EDITOR		
2)	\$1.00	2 cred.
3)	\$1.25	2 1/2 cred.
4)	\$1.50	4 cred.
5)	\$2.00	6 cred

DISPLAY VIEW

**Clear** This will clear out the current entries to allow a new price mode to be entered.

**Repeat(1-20)** This will cause all entries above the current line to be repeated the number of times specified. This is only available when there are no pricing levels below the current line.

Example: 1/\$0.50      2/\$1.00      15/\$5.00

Use the "Edit New Pricing Mode" feature described below to clear out the current levels.

Use "+" and "Enter" to specify 1/2 credit for \$0.25:

CUSTOM PRICING EDITOR		
1)	\$0.25	1/2 cred.

DISPLAY VIEW

Now, use "-" until the display shows "Repeat 20". The display will show the following:

CUSTOM PRICING EDITOR		
1)	\$0.50	1 cred.
2)	REPEAT 20	

DISPLAY VIEW

Press "Enter" and the display will show the following:

CUSTOM PRICING EDITOR		
1)	\$0.25	1/2 cred.
2)	\$0.50	1 cred.
3)	\$0.75	1 1/2 cred.
4)	\$1.00	2 cred

DISPLAY VIEW

Actually, by repeating the 1st line 20 times the pricing mode is currently set up as follows, but only the 1st four lines are displayed.

CUSTOM PRICING EDITOR		
1)	\$0.25	1 /2 cred.
2)	\$0.50	1 cred.
3)	\$0.75	1 1/2 cred.
4)	\$1.00	2 cred.
5)	\$1.25	2 1/2 cred.
6)	\$1.50	3 cred.
7)	\$1.75	3 1/2 cred.
8)	\$2.00	4 cred.
9)	\$2.25	4 1/2 cred.
10)	\$2.50	5 cred.
11)	\$2.75	5 1/2 cred.
12)	\$3.00	6 cred.
13)	\$3.25	6 1/2 cred.
14)	\$3.50	7 cred.
15)	\$3.75	7 1/2 cred.
16)	\$4.00	8 cred.
17)	\$4.25	8 1/2 cred
18)	\$4.50	9 cred.
19)	\$4.75	9 1/2 cred.
20)	\$5.00	10 cred

DISPLAY VIEW

Now repeatedly press "Enter" to move the right hand column to the 20th level. The display will show (with "10 cred." blinking):

CUSTOM PRICING EDITOR		
17)	\$4.25	8 1/2 cred.
18)	\$4.50	9 cred.
19)	\$4.75	9 1/2 cred.
20)	\$5.00	10 cred

DISPLAY VIEW

Now press "+" repeatedly until the right hand column of line 20 reads "15 cred."

**Start Button:** Once the pricing mode has been specified, you exit the custom pricing editor by pressing the 'Start' button. This will bring up a menu with some or all of the following choices:

Choose an Option:  
Return to Editor  
Clear Pricing  
Ignore Changes  
Save Changes

DISPLAY VIEW

Use the "+" and "-" button to select your choice and press the "Enter" button to activate. The selections cause the following actions:

**Return To Editor:** This option will allow you to continue to edit the pricing information.

**Clear Pricing:** This option will clear out all pricing levels and bring you back to the pricing editor to create a pricing mode from scratch.

**Ignore Changes:** This option will discard the work done in the previous pricing editor and leave the previously installed pricing mode in the game.

**Save Changes:** Press "Enter" to save your custom edited pricing mode and install it as the pricing for the game. Note that this choice will not be displayed if there is not at least one pricing level specified in the pricing editor, or if no changes have been made.

**Exit Pricing Editor:** This option will appear if no changes have been made. It will exit the Pricing Editor leaving the pricing as is.

**Pricing Table**

Country	Coin Chutes Left Center Right 4th Chute				Games/Coins	Display	Pricing Adjustments A3 02 03 04 05 06 07 08 09
USA	25¢	\$1.00*	25¢	\$1.00	1/50¢, 2/75¢, 3/\$1 <sup>2</sup>	50¢, 75¢, \$1.00	
	25¢	\$1.00*	25¢	\$1.00	1/75¢, 2/\$1.50, 3/\$2.00 <sup>2</sup>	1/75, 3/2.00	
	25¢	\$1.00	25¢	\$1.00	1/3x25¢ <sup>2</sup>	USA 1/\$0.75	
	25¢	\$1.00	25¢	\$1.00	1/50¢, 2/\$1 <sup>2</sup>	USA 2/\$1.00	
	25¢	\$1.00	25¢	\$1.00	1/50¢, 3/\$1.00 <sup>2</sup>	USA 3/\$1.00	
	25¢	\$1.00	25¢	\$1.00	1/2x25¢, 2/\$1.00, 3/\$1.50, 6/\$2.00 <sup>2</sup>	USA 6/\$2.00	
	25¢	\$1.00	25¢	\$1.00	1/2x25¢, 2/\$1.00, 3/\$1.50, 5/\$2.00 <sup>2</sup>	USA 5/\$2.00	
	25¢	\$1.00	25¢	\$1.00	1/3x25¢, 2/\$1.50, 4/\$2.00 <sup>2</sup>	1/75, 4/\$2.00	
	25¢	\$1.00	25¢	\$1.00	1/2x25¢, 2/\$1.00, 4/\$1.50, 6/\$2.00 <sup>2</sup>	6/\$2.00 4/\$1.50	
	25¢	25¢	25¢	-	1/4x25¢, 6/\$5.00 <sup>2</sup>	1/1, 6/5	
	25¢	25¢	25¢	-	1/4x25¢ <sup>2</sup>	1/\$1.00	
Canada	25¢	-	\$1.00	-	1/50¢, 2/75¢, 3/\$1 <sup>2</sup>	CAN. 50-75-1	
	25¢	-	\$1.00	-	1/50¢, 2/\$1 <sup>2</sup>	CAN. 2/\$1.00	
	25¢	-	\$1.00	-	1/50¢, 3/\$1.00 <sup>2</sup>	CAN. 3/\$1.00	
	25¢	-	\$1.00	-	1/2x25¢, 2/4x25¢, 3/\$1.00 <sup>2</sup>	3/\$1.00 Coin	
	25¢	-	\$1.00	-	1/2x25¢, 2/\$1.00, 3/\$1.50, 6/\$2.00 <sup>2</sup>	CAN. 6/\$2.00	
	25¢	-	\$1.00	-	1/2x25¢, 2/\$1.00, 3/\$1.50, 5/\$2.00 <sup>2</sup>	CAN. 5/\$2.00	
	25¢	-	\$1.00	-	1/2x25¢, 2/\$1.00, 3/\$1.50, 4/\$2.00 <sup>2</sup>	6/\$2.00	
	25¢	-	\$1.00	-	1/3x25¢, 2/\$1.50, 4/\$2.00 <sup>2</sup>	1/75, 4/2.00	
	25¢	-	\$1.00	-	1/75¢, 2/\$1.50, 3/\$2.00 <sup>2</sup>	1/75, 3/2.00	
	25¢	-	\$1.00	-	1/3x25¢ <sup>2</sup>	CAN. 1/\$0.75	
Austria	5sch	10sch	10sch	-	1/2x5sch, 3/2x10sch <sup>2</sup>	AUSTRIA	
	5sch	-	10sch	-	12/5sch, 5/10sch <sup>2</sup>	CUSTOM	02 00 05 00 01 00 01 00
Australia	20¢	\$1	\$1	\$2	1/\$1, 3/\$2 <sup>2</sup>	AUSTRALIA 1	
	20¢	\$1	\$2	\$2	1/\$1, 2/\$2 <sup>2</sup>	AUSTRALIA 2	
U.K.	£1.00	50P	20P	10P	1/3x10P, 2/50P, 4/61 <sup>2</sup>	U. KINGDOM	
Switzerland	1Fr	2Fr	5Fr	-	1/1Fr, 3/2Fr, 7/5Fr <sup>2</sup>	SWISS 1	
	1Fr	2Fr	5Fr	-	1/2Fr, 2/3Fr, 3/4Fr, 5/5F <sup>2</sup>	SWISS 2	
Belgium	5Fr	20Fr	50Fr	-	1/4x5Fr, 1/20Fr, 3/50Fr <sup>2</sup>	BELGIUM	
Germany	1DM	2DM	5DM	-	1/2DM, 2/3DM, 3/4DM, 4/5DM <sup>2</sup>	GER. 4/5DM	
					1/2DM, 2/3DM, 3/4DM, 5/5DM <sup>2</sup>	GER. 1/2DM	
					1/1DM, 2/2DM, 5/5DM <sup>2</sup>	GER. 1/1DM	
					1/1DM, 2/2DM, 6/5DM <sup>2</sup>	GER. 6/5DM	
Holland	1G	-	1G	-	1/1G <sup>2</sup>	HOLLAND	
Sweden	1Kr	5Kr	10Kr	1Kr	1/10Kr, 2/15Kr, 3/20Kr <sup>2</sup>	SWEDEN 1	
	1Kr	5Kr	10Kr	1Kr	1/5Kr <sup>2</sup>	SWEDEN 2	
France	1Fr	5Fr	10Fr	20Fr	1/3x1Fr, 2/5Fr, 5/10Fr, 10/20Fr <sup>2,3</sup>	TARIF 1	
	1Fr	5Fr	10Fr	20Fr	1/2x1Fr, 3/5Fr, 7/10Fr, 14/20Fr <sup>2,3</sup>	TARIF 2	
	1Fr	5Fr	10Fr	20Fr	1/5Fr, 3/10Fr, 7/2x10Fr, 7/20Fr <sup>2,3</sup>	TARIF 3	
	1Fr	5Fr	10Fr	20Fr	2/5Fr, 4/10Fr, 9/2x10Fr, 9/20Fr <sup>2,3</sup>	TARIF 4	
	1Fr	5Fr	10Fr	20Fr	2/5Fr, 5/10Fr, 11/2x10Fr, 11/20Fr <sup>2,3</sup>	TARIF 5	
	1Fr	5Fr	10Fr	20Fr	1/5Fr, 3/10Fr, 6/20Fr <sup>2,3</sup>	TARIF 6	
Italy	500L	500L	500L	-	1/500L <sup>2</sup>	ITALY 1	
	500L	500L	500L	-	1/2x500L, 3/4x500L <sup>2</sup>	ITALY 2	
	500L	500L	500L	-	1/2x500L, 2/4x500L <sup>2</sup>	ITALY 3	
Spain	100P	-	500P	-	1/100P, 6/500P <sup>2</sup>	SPAIN	
	25P	-	100P	-	1/25P, 5/100P <sup>2</sup>	CUSTOM	01 00 04 00 01 04 01 00
	25P	-	100P	-	1/25P, 4/100P <sup>2</sup>	CUSTOM	01 00 04 00 01 00 01 00
	25P	-	100P	-	1/2x25P, 2/100P <sup>2</sup>	CUSTOM	01 00 04 00 02 00 01 00
	25P	-	100P	-	1/2x25P, 3/100P <sup>2</sup>	CUSTOM	03 00 12 00 04 00 01 06
Japan	100¥	-	100¥	-	1/100¥ <sup>2</sup>	JAPAN	
Chile	Token	-	Token	-	1/1Token <sup>2</sup>	CHILE	
Denmark	1Kr	5Kr	10Kr	20Kr	1/2x1 Kr, 3/5 Kr, 7/10 Kr <sup>2</sup>	DENMARK 1	
	1Kr	5Kr	10Kr	20Kr	1/5 Kr, 3/10 Kr, 6/20 Kr <sup>2</sup>	DENMARK 2	
Finland	1Mka	-	5Mka	-	1/2x1Mka, 3/5Mka <sup>2</sup>	FINLAND 1	
	1Mka	-	5Mka	-	1/3x1Mka, 2/5Mka <sup>2</sup>	FINLAND 2	
New Zealand	\$1.00	-	\$2.00	-	1/\$1, 3/\$2 <sup>2</sup>	NEW ZEALAND 1	
	\$2.00	-	\$1.00	-	1/\$1, 3/\$2, (\$2-\$1 door)	NEW ZEALAND 2	
Norway	5Kr	-	10Kr	-	1/5Kr, 2/10Kr, 5/20Kr <sup>2</sup>	NORWAY	
Argentina	10¢	10¢	10¢	-	1/1 Token <sup>2</sup>	ARGENTINA	
Greece	10D	20D	50D	-	1/2x10D, 1/20D, 3/50D	GREECE	
Antilles	25¢	25¢	1G	-	1/25¢, 4/1G	ANTILLES	
Netherlands	1Hfl	2.5Hfl	2.5Hfl	-	1/1Hfl, 3/2.5Hfl	NETHERLANDS	
Hungary	20 Old	20 New	50F	-	1/40F, 2/60F, 4/100F	HUNGARY	

Note: 1. Factory Default. 2. Standard Setting - Change by pressing Enter button. 3. Other functions are also affected.

\* Only if Bill Acceptor and Center Chute are available.

## **A.4 H.S.T.D. Adjustments**

### **A.4 01 Highest Scores**

The game maintains a record of the four highest scores achieved to date.

OFF - No high scores are recorded, or displayed.

ON - The four highest scores are stored in memory and displayed in Attract Mode.

### **A.4 02 H.S.T.D. Award**

The award given for achieving the High Score To Date, or the Champion H.S.T.D.: Credit or a Ticket.

### **A.4 03 Champion H.S.T.D.**

The "Highest" High Score can be displayed in the Attract Mode. This score is not cleared when "High Score Reset Every" occurs.

ON - The "Highest" High Score is retained in memory and displayed.

OFF - The "Highest" High Score is not retained.

### **A.4 04 Champion Credits**

The number of credits or tickets awarded for a Grand Champion Score.

Range: 00 to 10.

### **A.4 05 H.S.T.D. 1 Credits**

### **A.4 06 H.S.T.D. 2 Credits**

### **A.4 07 H.S.T.D. 3 Credits**

### **A.4 08 H.S.T.D. 4 Credits**

The number of credits or tickets awarded whenever a player exceeds the 1st, 2nd, 3rd, or 4th highest score.

Range: 00 to 10.

### **A.4 09 High Score Reset Every**

The number of games to be played before an automatic reset of the displayed "Highest Score" occurs. The values provided upon reset are those selected by the operator in the Back-up High Scores.

Range: OFF (disabled); 250 to 20,000.

### **A.4 10 Backup Champion**

The Back-up Grand Champion Score.

Range: 00 to 999,000,000.

### **A.4 11 Backup H.S.T.D. 1**

### **A.4 12 Backup H.S.T.D. 2**

### **A.4 13 Backup H.S.T.D. 3**

### **A.4 14 Backup H.S.T.D. 4**

The first through the fourth Back-up High Score values. The game automatically restores this value when the High Score Reset Every value is reached.

Range: 00 - 999,000,000.

## A.5 Printer Adjustments (optional board required)

### A.5 01 Column Width

The column width to be printed. Range: 22 to 80.

### A.5 02 Lines Per Page

The amount of lines per page. Range: 20 to 80.

### A.5 03 Pause Every Page

Choose whether the printer pauses at the end of a page.

YES - The printer does pause.

NO - The printer doesn't pause.

### A.5 04 Printer Type

Select the type of printer: Parallel, Serial, ADP, Mini-Drucker, or NSM.

### A.5 05 Serial Baud Rate

Select which baud rate to use for serial or ADP communications (bit rate): 300, 600, 1200, 2400, 4800, or 9600.

### A.5 06 Serial D.T.R. (Data Terminal Ready)

When a serial printer is used, this line may be connected to a printer output line signaling that the printer is busy.

NORMAL - Normal D.T.R. signal goes low to indicate the printer is not ready.

INVERTED - Inverted D.T.R. (busy) signal goes high to indicate the printer is not ready.

IGNORE - D.T.R. signal is ignored.

### A.5 07 Auto Printout

With the optional printer board installed, this adjustment allows the initiation of printouts whenever the game detects a printer connected to the game. Parallel printers are detected automatically by plugging them in and putting them on-line. Serial printers (or computers) are detected by sending a carriage return (ASCII 0x0D) or XON (ASCII 0x11).

This adjustment has the following settings:

OFF	Disable automatic printouts
MAIN AUDITS	Main Audit Table (B.1)
EARNINGS	Earning Audits (B.2)
STD. AUDITS	Standard Audits (B.3)
FEATURES	Feature Audits (B.4)
HISTOGRAMS	Histograms (B.5)
TIMESTAMPS	Time Stamps (B.6)
ALL DATA	All of the above data

The table specified above will automatically be printed when a printer (or computer) is detected.

If the printer is detected during game over or test mode, the printout will be taken right away.

If the printer is connected while a game is being played, it will take up to 10 seconds to be detected, after which the printout will occur. The game will resume after the printout is complete.

Automatic printouts will only take place if the coin door is open.

After an automatic printout has been generated, a 2nd automatic printout will not be possible until a new game has started, or test mode begins.

## ERROR MESSAGES

The WPC game program has the capability to aid the operator and service personnel. At game turn-on, or after pressing the Begin Test switch, once the game has been operating for an extended period, the display may signal with a message, "Press ENTER for Test Report". This indicates the game program has detected a possible problem with the game.

To obtain details of the problem open the coin door and press the Begin Test switch. Press the Enter button to begin displaying the message(s). The following messages apply to your game.

### **Check Switch ##.**

This message indicates that at least one switch was stuck 'On' at game turn-on or has NOT been actuated during ball play (for 90 balls or apx. 30 games). The game program compensates the game play requirements affected by each disabled switch to allow 'nearly normal' play. This helps keep your game earning, until the service technician can repair the problem.

To verify the problem, refer to the Test Menu text describing Switch Testing, and check each reported switch using applicable switch tests. Always check switch operation using a ball, to simulate game conditions. Switch problems may often be resolved by adjusting the wire switch actuators, fixing switch circuitry problems, securing loose connectors, etc. Mechanisms using 'opto switches' (drop targets, etc.) need to be checked for proper power connections (+12V dc and ground).

### **Check Fuses F115 and F116 and Opto 12V Supply**

This message will be displayed if the game senses that all optical switches are not functioning. This usually occurs when there is no 12V supply to the playfield optics.

The problem is likely to be a blown fuse (F115 or F116), or at connectors J112, J116, J117 or J118 on the power driver board.

### **Opto Trough Bad Check Connectors, Wires and 12V Supply.**

This message will be displayed if all of the optics in the playfield ball trough are not functioning. This is usually caused by a problem with a ball trough connector supplying 12V and ground for the optical circuits.

### **Pinball Missing.**

This game normally uses four balls, however, it will operate with less. This message announces that a ball is missing or stuck. When the ball is located, return it to the game via the Outhole. Other possibilities for this problem could be malfunctions of the Ball Trough switches or the Ball Shooter switch.

### **xxxxx Sw. is Stuck On.**

This message indicates that a switch, which is not usually On, remains in the On position after the game is switched On. The stuck switch is essential for game play (for example, a coin chute switch, the slam tilt switch, the plumb bob tilt switch), and should be cleared to permit proper game operation.

**Ground Short Row-N, Wht-xxx.**

This message indicates that the switch wires being called out are touching a grounded part on the playfield or coin door. The following should be checked:

1. Slam tilt (or other coin door switch) touching the grounded coin door.
2. A leaf-type, playfield switch touching a grounded part.
3. Players poking metallic objects (wires, coat hangers, etc.) into the game.
4. Switch cable insulation pierced or damaged allowing bare wire contact with a grounded part.
5. All switches in a row closing at the same time. **Note:** This is NOT a switch problem; however, for most games it is a very rare possibility.

**U6 Checksum Error.**

The game ROM checksum is invalid. If this occurs replace the game ROM.

**Time and Date Not Set.**

The real time clock is not set. Go to U.4 of the Utilities Menu and set the time and date.

**Factory Settings Restored.**

This message indicates that the CMOS RAM (U8) no longer retains any custom Pricing or Game Adjustment settings and has reverted to factory default settings. Generally, the following CPU checks will isolate the cause of the CMOS RAM memory failure. The voltages at pin 28 and pin 26 of U8 should be +5V (game turned On) and at least +4V (game turned Off). When the voltage drops below +4V, memory reset occurs. Check the batteries and battery holder. Be sure that the batteries are good and that there is no contamination on the battery holder terminals. Turn the game OFF, and use an ohmmeter to check diodes D1 and D2 on the CPU Board. D1 should read 0 ohms when forward-biased and infinite ohms when reverse-biased. D2 should read 15 ohms when forward-biased and infinite ohms when reverse-biased. (Readings taken with an analog meter.) This message can also indicate that there is an open diode on a 50V coil circuit and noise is entering the circuit.

**CPU L.E.D.'s**

The CPU has three L.E.D.s located on the upper left side of the board D19, D20, and D21. On game power-up D19 and D21 turn on for a moment then, D19 turns off and D20 starts to blink rapidly. D21 remains on. The system has detected a problem if the following happens:

**CPU Board L.E.D. Error Codes**

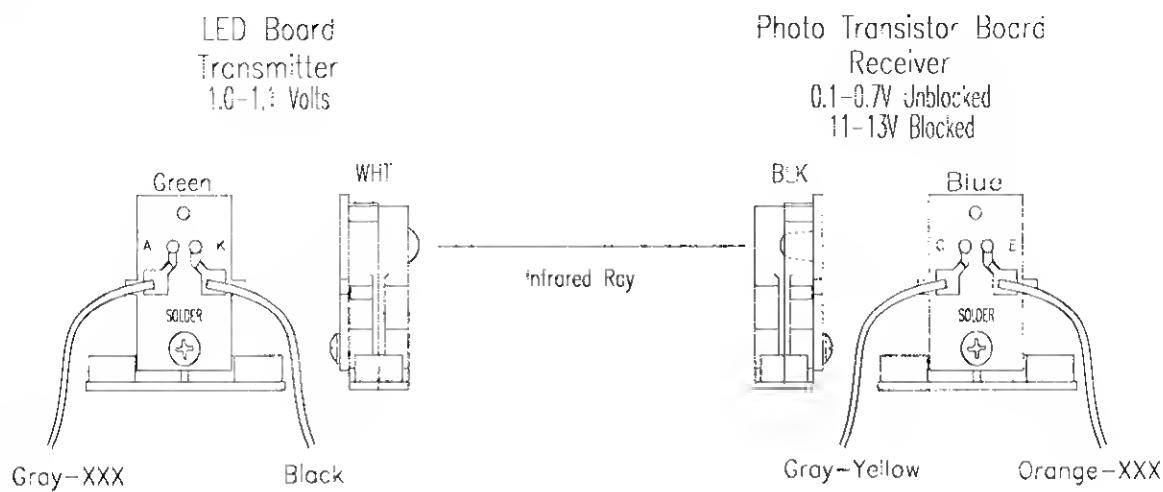
Center L.E.D. blinks one time	-	U6 ROM Failure
Center L.E.D. blinks two times	-	U8 RAM Failure
Center L.E.D. blinks three times	-	U9 Custom Chip Failure

**Sound Board Beep Error Codes****Upon Game Turn-On:**

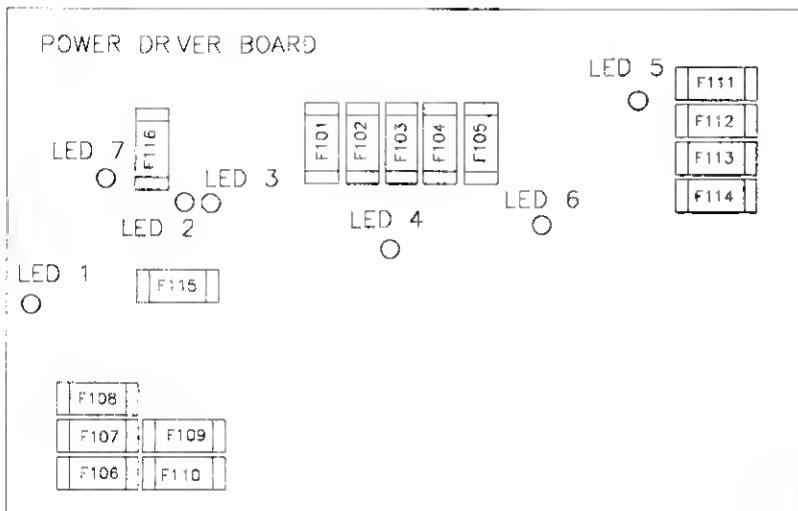
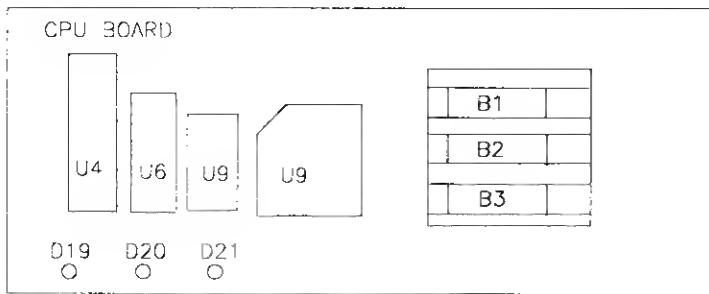
1 Beep	=	Sound Board O.K.
2 Beeps	=	U2 Failure
3 Beeps	=	U3 Failure
4 Beeps	=	U4 Failure
5 Beeps	=	U5 Failure
6 Beeps	=	U6 Failure
7 Beeps	=	U7 Failure
8 Beeps	=	U8 Failure
9 Beeps	=	U9 Failure

## Opto Theory

The opto receiver (Photo Transistor) should be approximately 0.1 - 0.7 volts when the opto beam is unblocked and approximately 11 - 13 volts when the opto beam is blocked. The opto transmitter (LED) should always be approximately 1.4 volts. **Note:** The transmitter (LED) is larger than the receiver (Photo Transistor); it protrudes further from its case.



## LED List



### CPU Board

D19, Blanking

D20, Diagnostic

D21, +5VDC

At game turn-on, D19 and D21 are on, D20 is off.

During normal operation, D19 is off, D20 is flashing and D21 is on.

### Dot Matrix Controller

D10, +5VDC, Normally On

### Power Driver Board

LED 1, +12VDC Switch Circuit, Normally On

LED 2, High/Low Line Voltage Sensor, Normally On

LED 3, High/Low Voltage Sensor, Normally Off

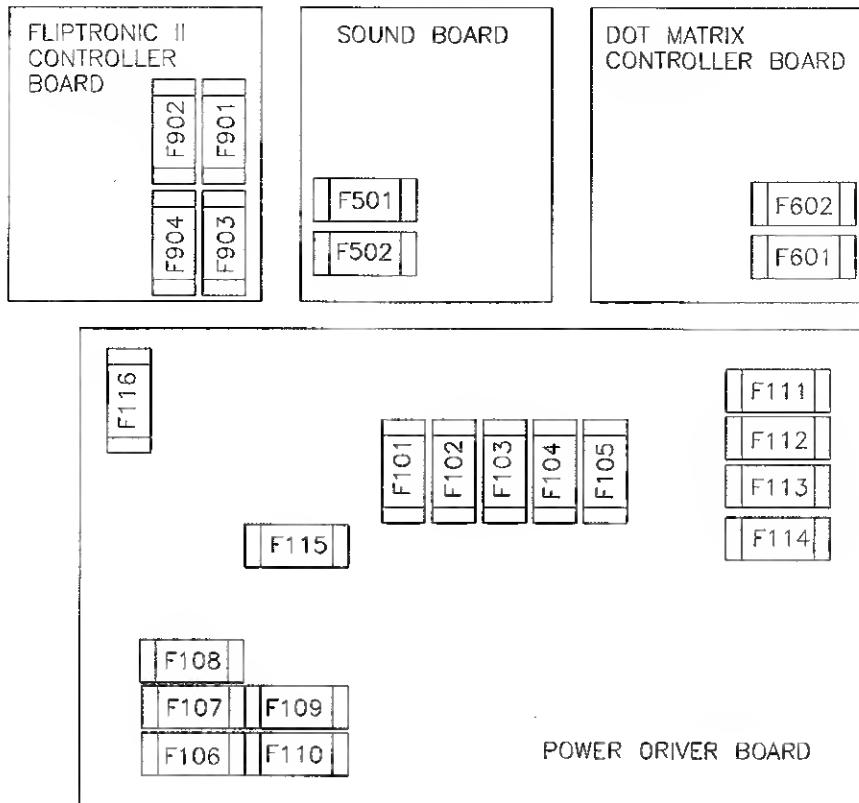
LED 4, +5VDC, Digital Circuit, Normally On

LED 5, +20VDC, Flashlamp Circuit, Normally On

LED 6, +18VDC Lamp Circuit, Normally On

LED 7, +12VDC, Power Circuit, (motors, relays, etc.), Normally On

## Fuse List



### Sound Board

F501 -25V Circuit	3A, S.B.
F502 +25V Circuit	3A, S.B.

### Dot Matrix Controller Board

F601 +62V Circuit,	3/8A, F.B.
F602 -113V & -125V Circuits	3/8A, F.B.

### Power Driver Board

F101 +50V general (l. flipper)	3A, S.B.
F102 +50V general (r. flipper)	3A, S.B.
F103 Solenoid #25-#28	3A, S.B.
F104 Solenoid #9-#16	3A, S.B.
F105 Solenoid #1-#8	3A, S.B.
F106 G.I. #5 Wht-Vio	5A, S.B.
F107 G.I. #4 Wht-Grn	5A, S.B.
F108 G.I. #3 Wht-Yel	5A, S.B.
F109 G.I. #2 Wht-Org	5A, S.B.
F110 G.I. #1 Wht-Brn	5A, S.B.
F111 Flasher Secondary	5A, S.B.
F112 Solenoid Secondary	7A, S.B.
F113 +5V Logic	5A, S.B.
F114 +18V Lamp Matrix	8A, N.B.
F115 +12V Switch Matrix	3/4A, S.B.
F116 +12V Secondary	3A, S.B.

### Fliptronic II Controller Board

F901 Upper Right Flipper	3A, S.B.
F902 Upper Left Flipper	3A, S.B.
F903 Lower Right Flipper	3A, S.B.
F904 Lower Left Flipper	3A, S.B.

### Line Filter

Domestic Game	8A, N.B.
Foreign Game	5A, S.B.

## MAINTENANCE INFORMATION

### LUBRICATION

The two main lubrication points of the Ball Release mechanism are the pivots for the arm. The mechanisms of other playfield devices are somewhat similar to the Ball Release device, and have the same lubrication requirements. A medium viscosity oil (switch target grease) is satisfactory for these devices.

Because of the functional design (arm-actuated via solenoid plunger operation), the pivot points of the Left and Right Kickers ("Slingshots") all require lubrication as a regular servicing procedure.

Lubrication to ensure proper operation also applies to the target blades of the Drop Targets. MBI Instrument Grease, also known as Drop Target Switch Lubricant, with a Williams' part number of EI165, is a recommended lubricant.

### SWITCH CONTACTS

#### Playfield Switches

For proper game operation, switch contacts should be free of dust, dirt, contamination, and corrosion. Blade switch contacts are plated to resist corrosion. Cleaning blade switch contacts requires gentle closing of the contacts on a clean business card or piece of paper, and then pulling the paper about 2 inches, which should restore the clean contact surface. Adjust the switch contacts to a 1/16-inch gap.

#### Flipper Switches

This game uses the new Fliptronic II Electronic Flipper System. The End-of-Stroke switches are NORMALLY OPEN. The switch should close when the flipper is energized. All E.O.S. switches are gold flashed computer grade leaf switches. Only low computer current is carried through these switches. DO NOT FILE or abrasively clean these switches! DO NOT REPLACE these switches with the old style tungsten high current type switches as intermittent operation could occur. **Note:** Unlike the old style of flipper, an E.O.S. switch failure does not harm the flipper. The game notifies the operator of the switch being mis-adjusted in the test report, but continues to play. The E.O.S. switches are a means by which the new electronic flippers feel and play with all of the subtleties of the old flippers.

### CLEANING

Good game action and extended playfield life are the results of regular playfield cleaning. During each collection stop, the playfield glass should be removed and thoroughly cleaned and the playfield should be wiped off with a clean, lint-free cloth. The game balls should be cleaned and inspected for any chips, nicks, or pits. Replace any damaged balls to prevent playfield damage.

Regular, more extensive, playfield cleaning is recommended. However, avoid excessive use of water and caustic or abrasive cleaners because they tend to damage the playfield surface. Playfield wax (or any carnauba based wax), or polish may be used sparingly, to prevent a buildup on the playfield surface. Do not use cleaners containing petroleum distillates on any playfield plastics because they may dissolve the plastic material or damage the artwork.

# NO FEAR

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*Unit Disassembly for Repair*

*Major Component Service Instructions*

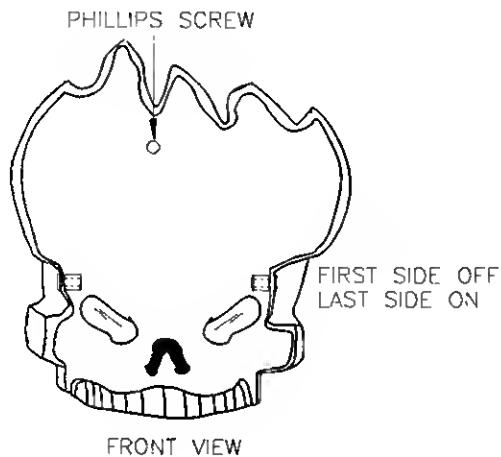
**REMEMBER**

**ALWAYS TURN OFF AND UNPLUG YOUR GAME BEFORE  
ATTEMPTING TO REPLACE OR REPAIR ANY COMPONENTS.**

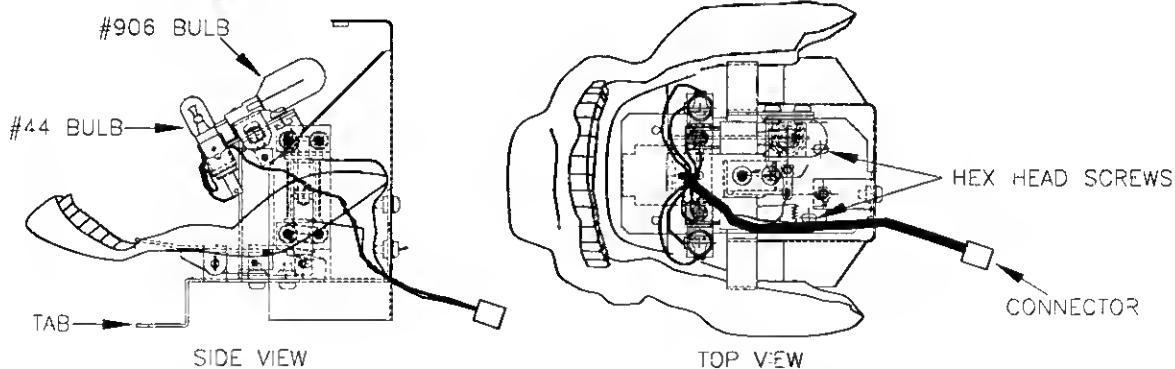
## **SKULL ASSEMBLY**

- 1) The Skull Assembly is in two pieces: the upper part is the face and the lower part is the base. The base contains the lower jaw.
- 2) To remove the face, unscrew the small Phillips screw located at the top middle of the skull forehead. Carefully, stretch the right side of the face and pull it off of the base first, then do the same to the left side. When re-attaching the face, snap the left side on first, then the right side. *Do not stretch both sides of the face at the same time, or the eyes will pop out.*
- 3) The four bulbs are now accessible. This assembly uses two #906 bulbs (large bulbs), and two #44 bulbs (small bulbs).
- 4) To remove the base from the playfield, raise the playfield and unplug the connector going to the Skull Assembly. Lower the playfield.
- 5) Remove the two hex head screws that hold the base to the playfield.
- 6) The front of the base is held down by a tab that slides into a slot in a metal bracket. Slide the base back so that the tab clears the slot.
- 7) Lift the base off of the playfield.

### **FACE**



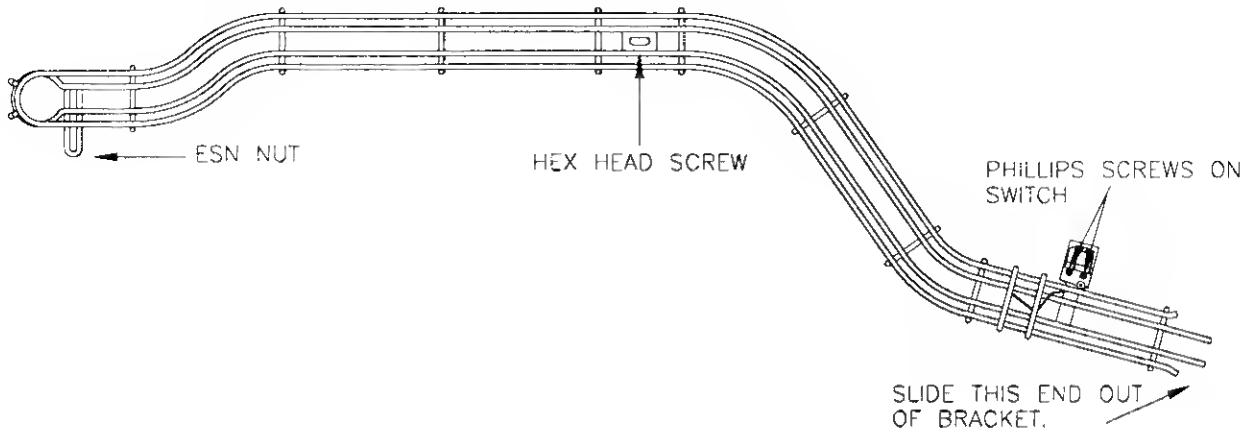
### **BASE**



## RAMPS

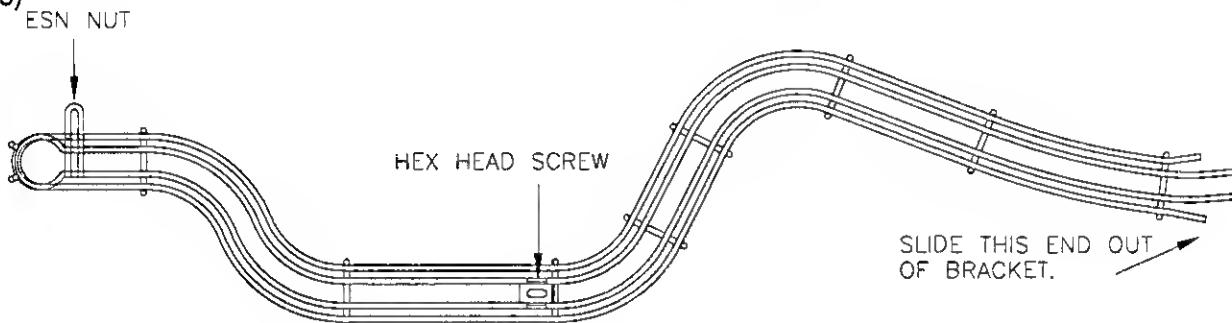
### Left Wire Ramp

- 1) Remove one ESN nut by the drop hole and one hex head screw near the Hurry-up sign.
- 2) Unscrew two small Phillips screws from the switch.
- 3) Slide the ramp forward, out of the bracket holding it from the rear.



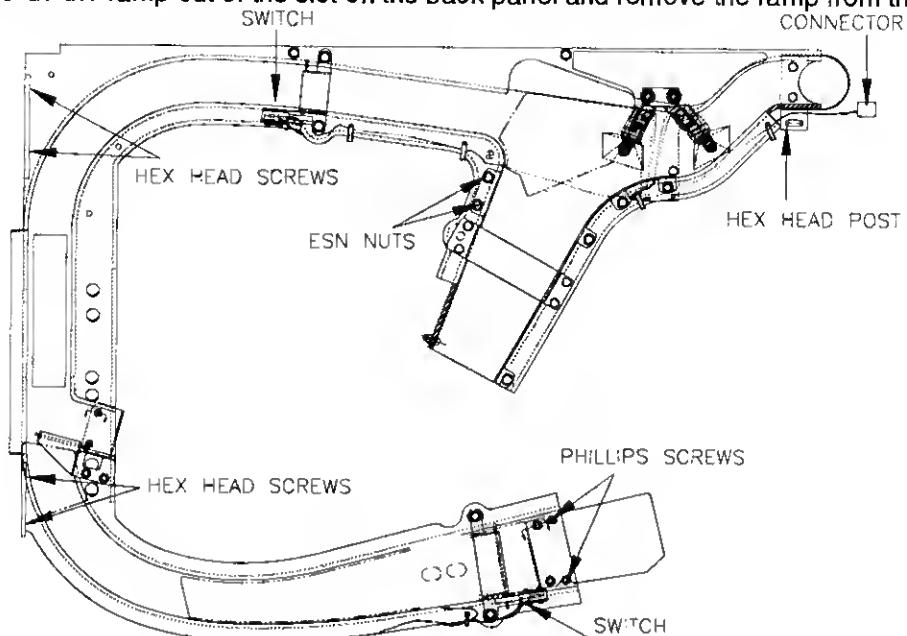
### Right Wire Ramp

- 1) Remove one ESN nut by the drop hole and one hex head screw near the mountain.
- 2) Slide the ramp forward, out of the bracket holding it from the rear.
- 3)



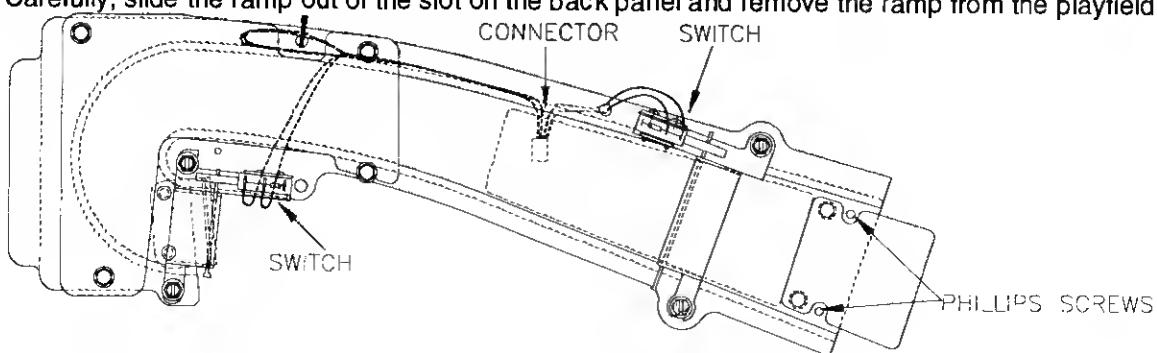
### **Ramp Assembly #1**

- 1) Raise the playfield all the way up, and lean it against the backbox. Unplug connectors for the lamps and the switches. Lower the playfield so that it rests on the safety brackets.
- 2) Remove the Left Wire Ramp
- 3) Remove the two small Phillips screws located on the sides of the left flap.
- 4) Remove the four hex head screws that secure the ramp to the back panel.
- 5) Remove the two ESN nuts that hold the ramp to the tall posts located near the upper flipper, and remove the hex head post that holds the ramp to a short post next to the drop hole ring.
- 6) Carefully, slide the ramp out of the slot on the back panel and remove the ramp from the playfield.



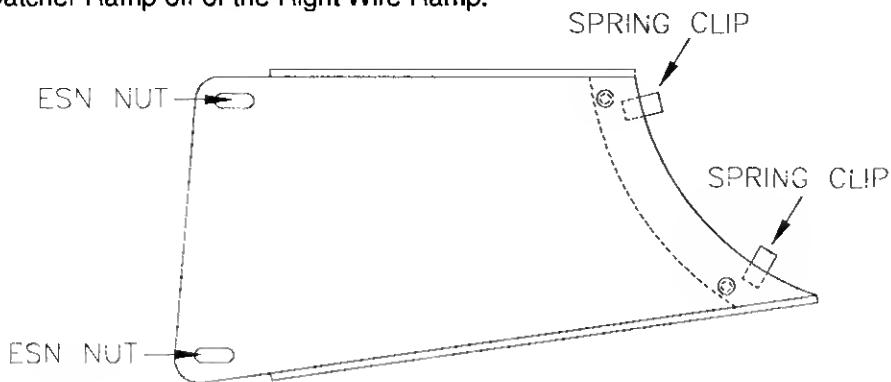
### **Ramp Assembly #2**

- 1) Raise the playfield all the way up, and lean it against the backbox. Unplug connectors for the switches. Lower the playfield so that it rests on the safety brackets.
- 2) Remove the Right Wire Ramp and Ramp Assembly #1
- 3) Remove two small Phillips screws located at the sides of the right flap.
- 4) Carefully, slide the ramp out of the slot on the back panel and remove the ramp from the playfield



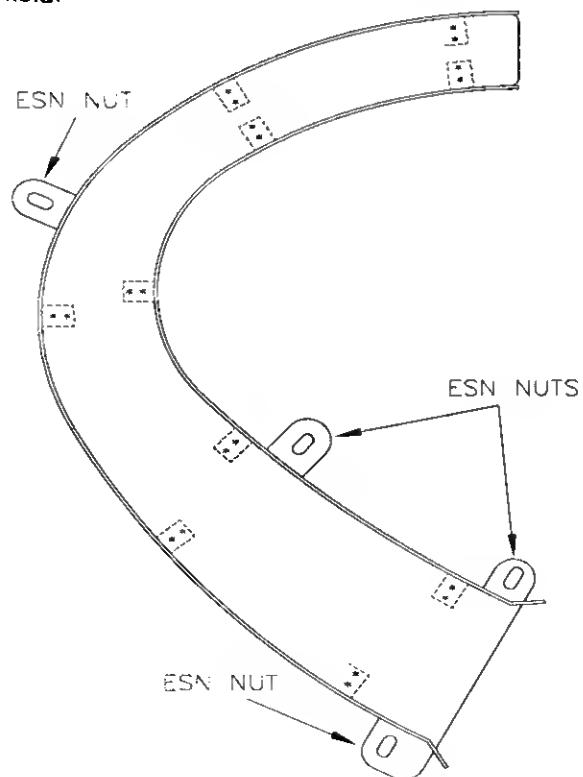
### **Catcher Ramp**

- 1) Remove the two ESN nuts from the posts located on either sides of the metal Ramp Catcher.
- 2) Reach under the metal plate on the Catcher Ramp and find the two spring clips. Press down on the spring clips to open them.
- 3) Slide the Catcher Ramp off of the Right Wire Ramp.



### **Ramp Catcher**

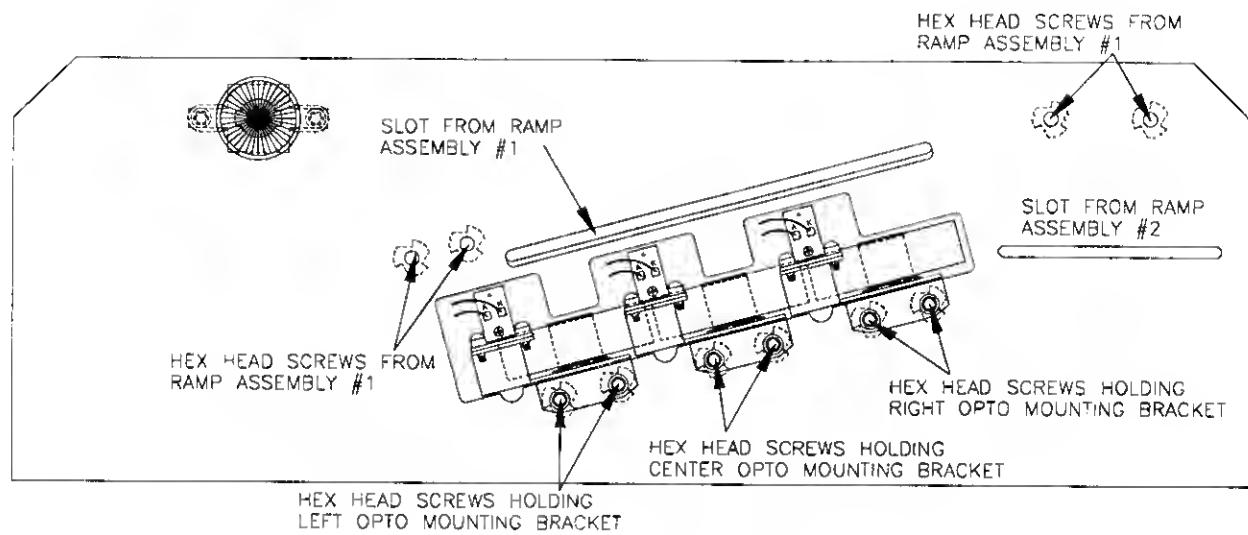
- 1) Remove the two ESN nuts from the posts located on either sides of the Ramp Catcher where it joins with the Catcher Ramp.
- 2) Remove the two ESN nuts from the posts located at the point where the Ramp Catcher curves.
- 3) Lift the ramp off the playfield.



## **MAGNET ASSEMBLIES**

- 1) Remove Left Wire Ramp and Ramp Assembly #1.
- 2) Remove two hex head screws on the desired Opto Mounting Bracket.
- 3) Slide the Opto Mounting Bracket forward, until the assembly clears the back panel.
- 4) Lift the magnet off of the bracket.

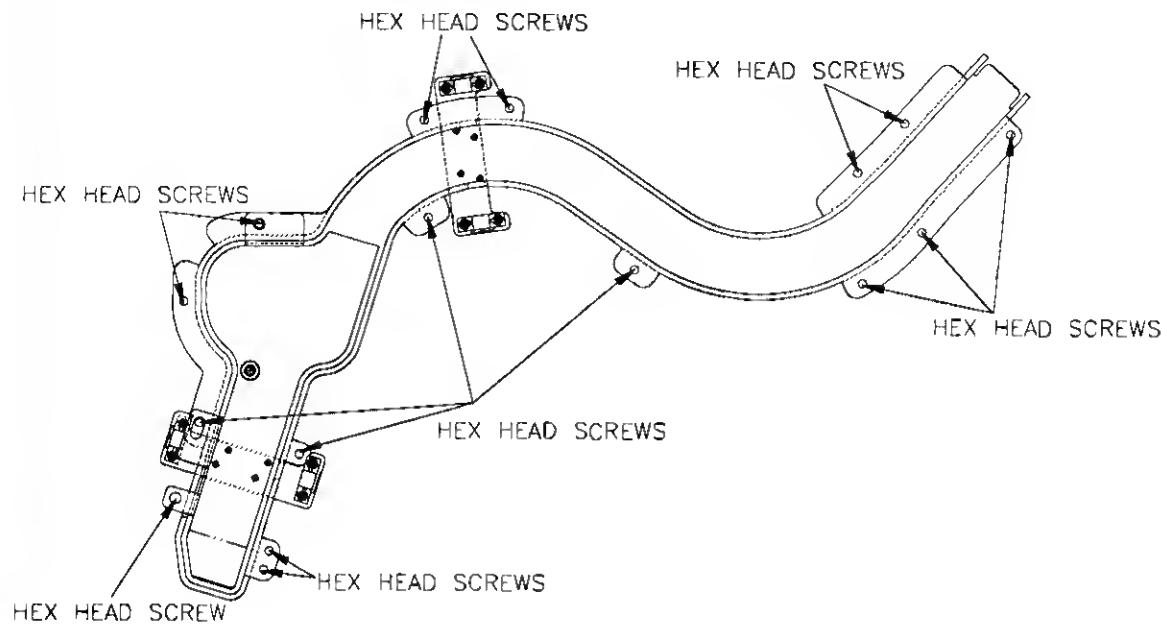
*When replacing magnet, be sure the thermal breaker faces the rear of the game. The thermal breaker is located in the bulging part of the magnet. It is a sensor that detects if the magnet gets too hot, and cuts it off if it does.*



FRONT VIEW

## **UNDERGROUND TROUGH**

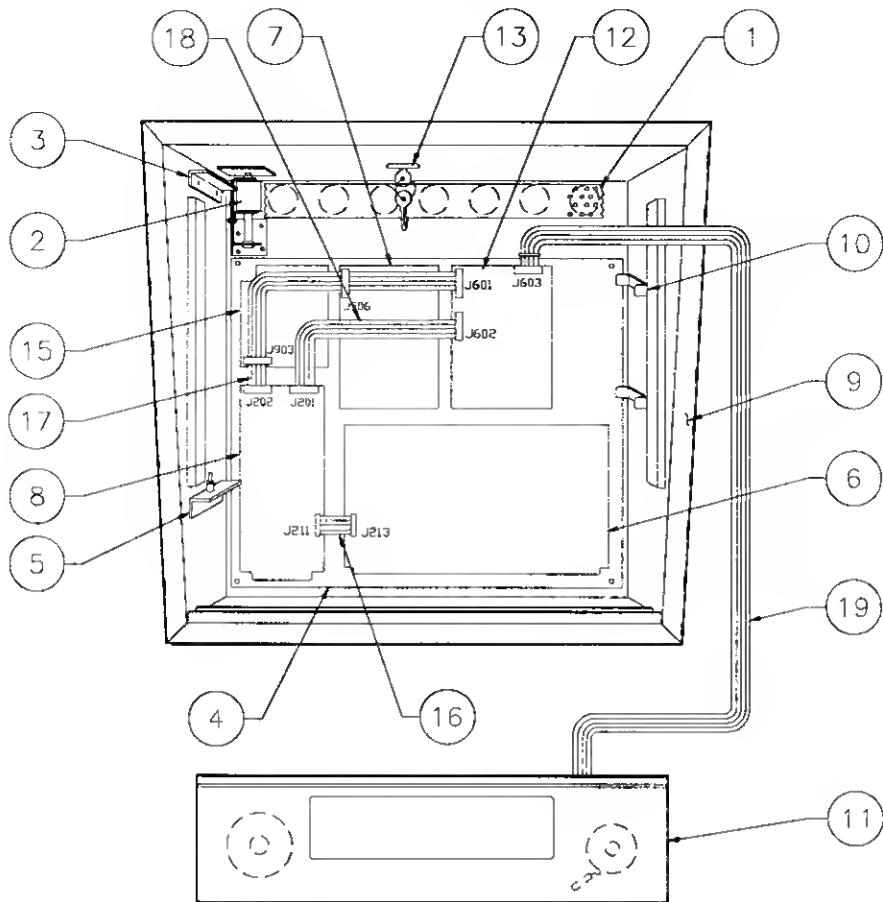
- 1) Raise the playfield all the way up, and lean it against the backbox.
- 2) Unplug the connector leading to the opto plates.
- 3) Remove all 15 hex head screws that hold the Underground Trough to the playfield, and lift off the trough.



# **SECTION TWO**

## **PARTS INFORMATION**

# 50025-BB Backbox Assembly



## Miscellaneous Parts

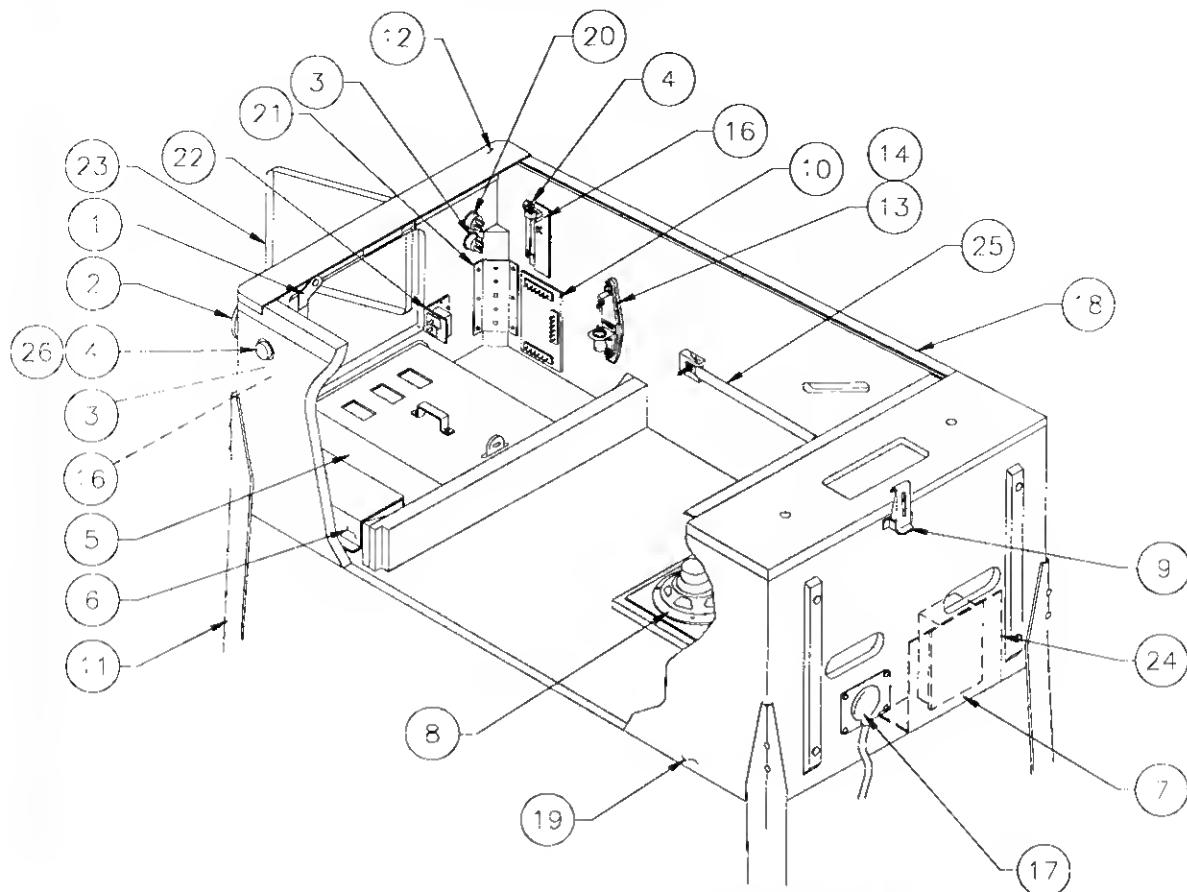
Item	Part Number	Description	Part Number	Description
1	01-6645	Venting Screen	A-8552-50025	Tempered Backglass Assy.
2	B-10686-1	Knocker Assembly	03-8228-2	Glass Channel Top (1)
3	A-12497	Insert Bd. Hinge Assy., Upper	03-8228-3	Glass Channel Edge (2)
4	A-14092-6	WPC Mounting Plate Assy.	03-8229-1	Glass Lift Channel (1)
5	A-12498	Insert Bd. Hinge Assy., Lower	08-7456	Backbox Glass: 27 x 18-7/8"
6	A-12697-3	Power Driver Assembly	20-9718	Wing Screw, 3/8-16 x 2"
7	A-16917-50025	Sound Board Assembly	31-1357-50025	Screened Translight
8	A-17651-50025	WPC Security CPU Board		
9	04-10012-50025	Backbox, Wood		
10	01-9047	Insert Stop Bracket		
11	A-19985	Speaker/Display Assembly		
12	A-14039-1	Dot Matrix Controller Board	H-14584	Dot Matrix Display Power Cable
13	A-13379	Lock & Plate Assembly	H-15476	Logic Power Cable
14	50025-IN	Insert Board	H-15736-1	Secondary Cable
15	A-15472-1	Fliptronic II Board	H-19997	Insert Cable

## Backbox Cables

16	5795-12653-03	Ribbon Cable, 3"
17	5795-13018-01	Ribbon Cable, 23.5"
18	5795-10938-15	Ribbon Cable, 15"
19	5795-13434-32	Ribbon Cable w/Ferrite 32"

# 50025-CAB

## Cabinet Assembly

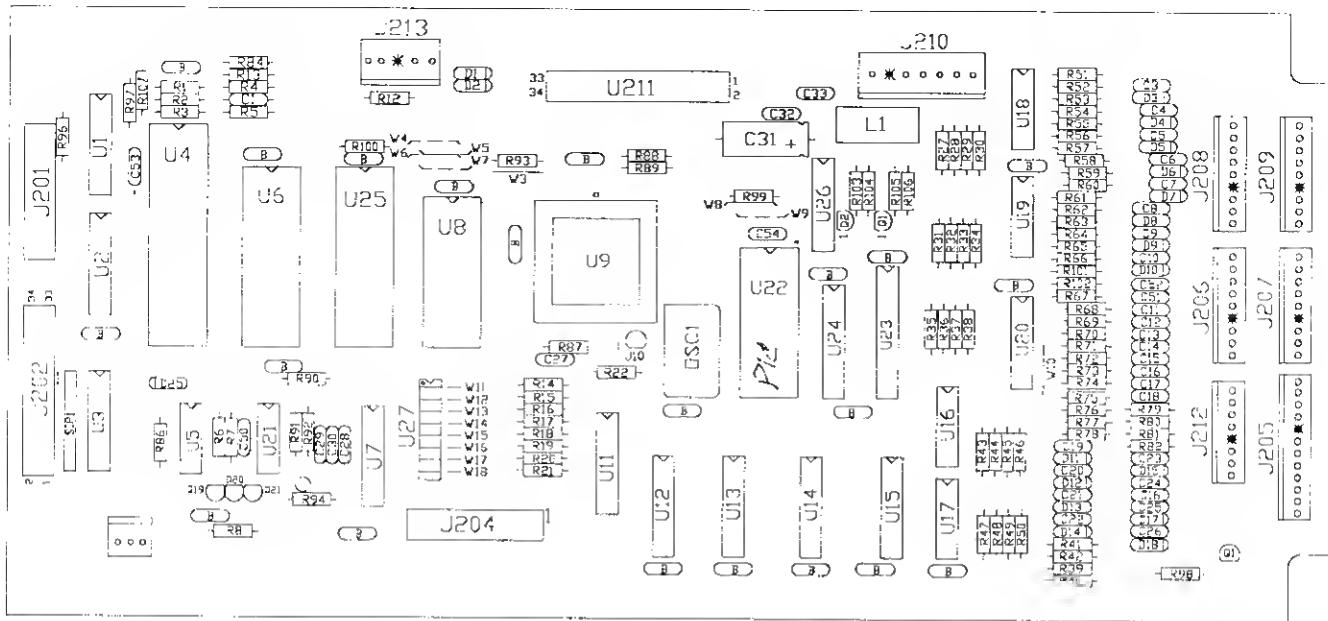


### Miscellaneous Parts

Item	Part Number	Description	Part Number	Description
1	A-16773-1	Lever Guide Assembly	A-17195	Tilt Switch Assy. w/Cable
2	20-9663-B-8	Push Button Round, No Fear	01-9011-L	Backbox Mtg. Bracket, Left
3	20-9663-18	Push Button w/Sw., Extra Ball	01-9011-R	Backbox Mtg. Bracket, Right
4	A-16883-4	Flipper Button, Red (2)	01-6389-1	Cashbox Lock Bracket
5	A-18531-1	4-Ball Cashbox Assembly	08-7028-T	Playfield Glass
6	A-17540	Univ. Power Interface Assy.	08-7377	Leg Leveler Adjuster, 3"
7	5610-14515-00	WPC Transformer	20-6500	Steel Ball, 1-1/16" (4)
8	5555-12929-00	Speaker, 4Ω, 6", 25w		
9	20-9347	Toggle Latch		
10	A-17051-1	Coin Door Interface Board		
11	A-19514	Leg Assembly, Chrome		
12	D-12615	Front Molding Assembly		
13	20-6502-A	Plum Bob	H-16810	50V Disconnect Cable
14	A-15361	Tilt Mechanism Assembly	H-17217	Plumb/Bob Mech. Protect Cable
15	*	Cordset	H-17837-2	Voltage Program Jumper Cable
16	A-17316	Opto Flipper Assembly (2)	H-19524	Cabinet Cable
17	01-10714	Line Cord Cover	H-19601-1	Power Extension Cable
18	A-12359-3	Side Molding Assembly (2)	H-20162	Cabinet Switch Lamp Cable
19	11-1230	Wood Cabinet	A-20201	Cable & Jumper Assy., Coin Door
20	20-9663-1	Push Button w/Sw., Start		
21	01-11400	Leg Plate (4)		
22	A-18249-1	Cable & Interlock Switch Assy.		
23	09-61000-1	Coin Door-USA		
24	01-13617	Drip Plate		
25	01-13916.3	Stay Arm Tube		
26	03-9366.1	Switch Disk		

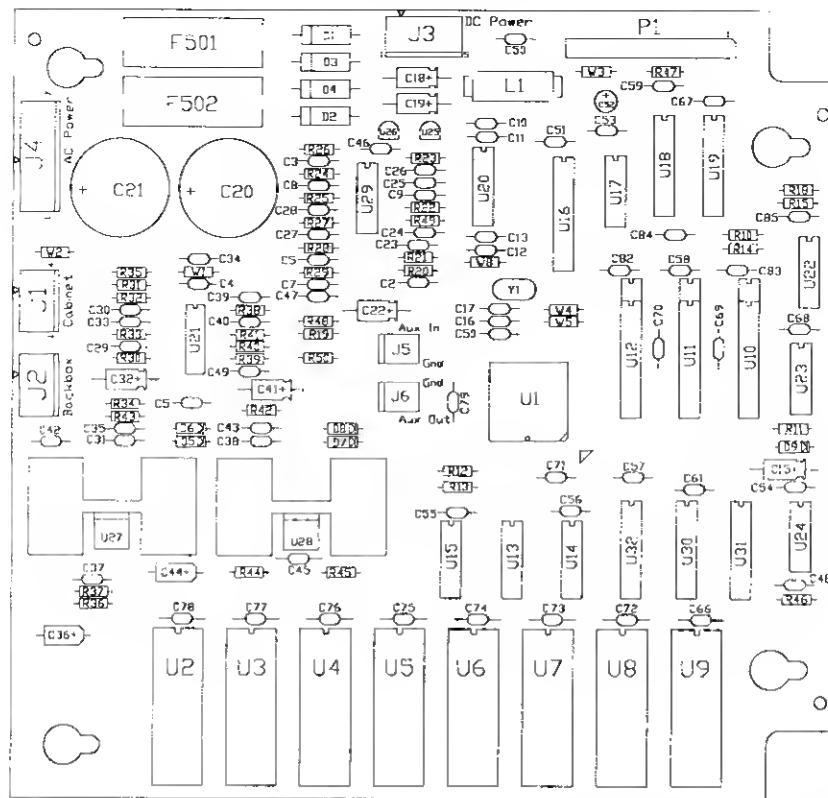
\* See Application Chart p.2-29.

**A-17651-50025**  
**WPC CPU Security Board Assembly**



Part Number	Designator	Description	Part Number	Designator	Description
5010-09034-00	R14-R22, R27-R42, R86, R94, R90, R98	Res., 10KΩ, 1/4w, 5%	5281-10182-00	U11-U13, U15	IC, 74LS240 / DRVR
5010-09314-00	R52, R54, R56, R58, R80, R62, R64, R66, R75-R82	Res., 1.2KΩ, 1/4w, 5%	5284-12651-00	U21	IC, 4548
5010-09358-00	R3, R43-R51, R53, R55, R57, R59, R81, R63, R65, R87-R74, R84, R101, R102, R105, R108	Res., 1KΩ, 1/4w, 5%	5315-13924-00	U23	IC, 74HC4514 LTC1 1to16 Dec.
			5281-09246-00	U26	IC, 74LS138 2T 4 Decoder
			5340-12556-00	U8	S/RAM 8Kx8 Low Power
			5370-12272-00	U16-U19	IC, LM399 Quad Comp
			5370-12687-00	U10	MC 34064
			5521-10931-00	OSC1	8.00MHZ OSC 14PIN DIP
			5520-12084-00	X1	Crystal 32.768 KHz
			5551-09822-00	L1	Inductor, 4.7μH, 3.0A.
5010-09416-00	R5-R8, R12, R13, R87-R89, R99, R100	Res., 470Ω, 1/4w, 5%	5671-14516-00	D19-D21	Display LED Red
5010-09085-00	R1, R2, R4, R93,R96, R97, R107	Res., 1.5KΩ, 1/4w, 5%	5700-08985-00	U4	Socket IC 40P .6"
5010-09534-00	W4, W7, W9	Res., 0Ω	5700-12088-00	U6	Socket IC 32P .8"
5010-10989-00	R92	Res., 470KΩ, 1/4w, 5%	5700-12424-00	U9	Socket 84 Pin PLCC
5010-12104-00	R91	Res., 22MΩ, 1/4w, 5%	5700-10176-00	U22	Socket IC 28 P .6"
5010-08991-00	R103, R104	Res., 4.7KΩ, 1/4w, 5%	5791-10850-00	J201, J204	Connector, 26-pin Header Str
5019-09362-00	SIP1	SIP 4.7K, 9R, 10P, 5%	5791-14090-05	J213	Connector, 5-pin Header Str
5040-08986-00	C31	Cap., 100M, 10v (±20%)	5791-10862-07	J210	Connector, 7-pin Header Str
5043-08980-00	B	Cap., .01M, 50v (+80, -20%)	5791-13830-08	J212	Connector, 8-pin Header Str
5043-09030-00	C27	Cap., .047M, 50v, (±20%)	5791-13830-09	J208, J209	Connector, 9-pin Header Str
5043-09065-00	C3-C26, C51, C52	Cap., 470P, 50v, (±20%)	5791-13830-11	J206, J207	Connector, 11-pin Header Str
5043-09491-00	C29, C30	Cap., .22P, 1KV (±10%)	5791-12516-00	J202, J211	34 Hen 2x17 Str
5043-09492-00	C28	Cap., 100P, 50v (±10%)	5048-11033-00	C50	Cap., .022 μF
5041-09163-00	C53, C54	Cap., 2.2μF, 15v (20%) Ax.	5043-09845-00	C32, C33	Cap., 12-pin Header Str
5070-08919-00	D2-D18	Diode, 1N4148 150MA	5645-09025-00	U27	Cap., 1KP, 50v (±10%)
5070-09266-00	D1, D25	Diode, 1N5817, 1.0A.	5162-12422-00	U20	Switch DIP 8 POS
5160-10269-00	Q1-Q3	Trans., 2N3904 NPN	A-5400-50025-1	U22	IC, ULN 2803A
5700-10389-00	U20	IC Socket 16-pin	A-5343-50025-1	U6	WPC PIC 16C57 Micro-C
5281-09308-00	U3	IC, 74LS245 TRNCV	A-17543	-	Game ROM Assembly
5281-09486-00	U14, U24	IC, 74LS374 8 D F/F	5400-10320-00	U4	Battery Holder PCB Assy.
5281-09851-00	U5	IC, 74LS14 SMT TRG	5410-12426-00	U9	MC68809E 2Mhz μP
5281-09867-00	U1, U2, U7	20-9665-1	-	-	WPC ASIC-89
		H-18258	-	-	PCB Standoffs
					WPC CPU Security Cable

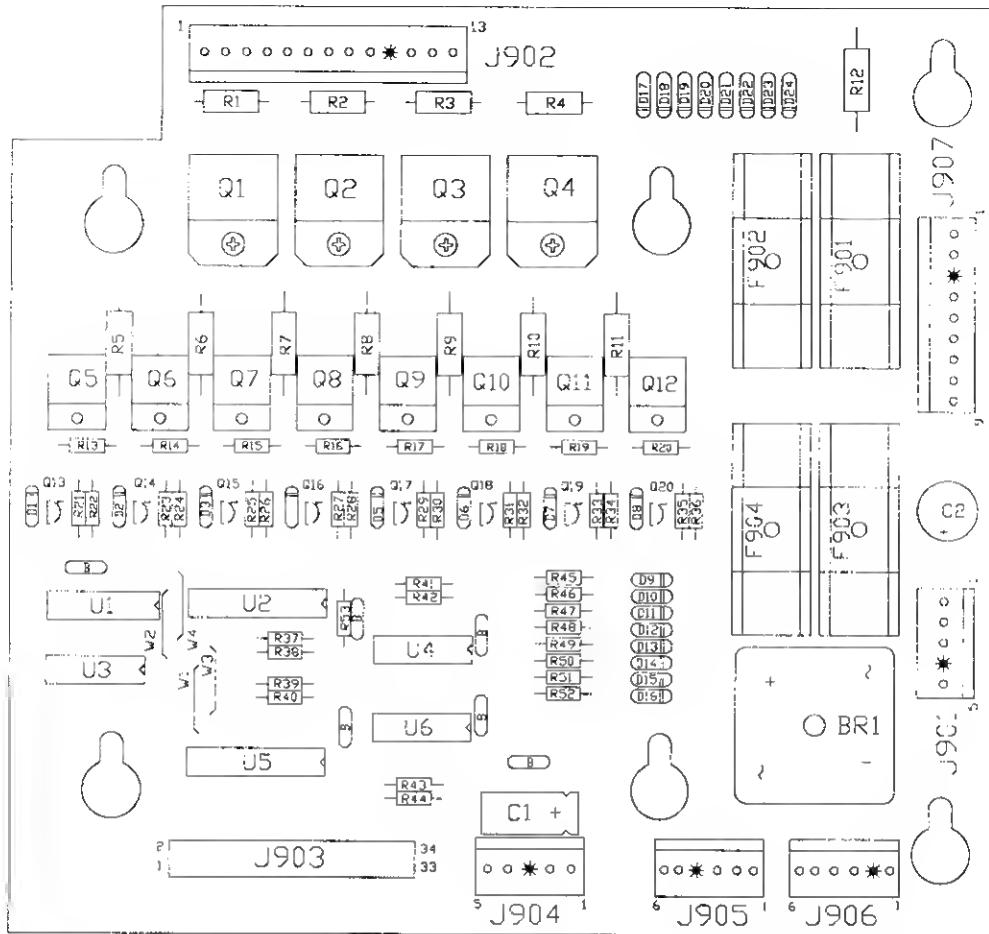
**A-16917-50025**  
**Sound Board Assembly**



Part Number	Designator	Description	Part Number	Designator	Description
4004-01005-06	U27, U28	MS, 4-40 x 3/8"	5070-09054-00	D5-D9	Diode Signal 1N4004
4404-01119-00	U27, U28	Nut 4-40	5250-13302-00	U25	78L05 Pos 5V reg TO-92
5010-08772-00	R39, R41	Resistor, 15KΩ, 1/4w, 5%	5250-13303-00	U26	79L05 Neg 5V Reg TO-92
5010-08774-00	R30, R34, R37, R42, R45	Resistor, 22KΩ, 1/4w, 5%	5283-10551-00	U17	IC74F00 Fast Quad NAND
5010-08991-00	R10, R12-R16	Resistor, 4.7Ω, 1/4 w, 5%	5311-10947-00	U22	IC74HC74 Dual D Flip Flop
5010-09034-00	R47	Resistor, 10KΩ, 1/4w, 5%	5311-10948-00	U23	IC74HC125 Quad Tri-State Buffer
5010-09035-00	R11, R19, R33, R40	Resistor, 47KΩ, 1/4w, 5%	5315-12009-00	U15	IC74HC138 1 of 8 Decoder
5010-09036-00	R46	Resistor, 100Ω, 1/4w, 5%	5311-12043-00	U18, U19	IC74HCT374 Octal D Flip Flop
5010-09219-00	R31, R32, R38	Resistor, 8.2KΩ, 1/4w, 5%	5311-12538-00	U13, U14	IC74HC174 Hex D Flip Flop
5010-09358-00	R50	Resistor, 1KΩ, 1/4 w, 5%	5311-12287-00	U24	IC74HC14 Hex Schmitt Inverter
5010-09534-00	W4, W6	Resistor, 0Ω (Jumper)	5340-13304-00	U30-U32	IC74HC541 Octal Bus Driver
5010-13420-00	R36, R44	Resistor, 680Ω, 1/4w, 5%	5370-12730-00	U10-U12	ICSRAM 2Kx8 35ns .300 DIP
5010-13607-00	R20-R29, R48, R49	Resistor, 6.2KΩ, 1/8w, 1%	5370-13419-00	U21, U29	ICTL084 Quad Op AMP
5010-13517-00	R35, R43	Resistor, 15Ω, 1/4w, 5%	5371-13299-00	U27, U28	Audio Power Amp TDA2030AV
5040-09365-00	C15, C18, C19, C32, C41	Cap., 1μF, 63v, Alum Ax.	5520-13301-00	U20	IC DAC AD-1851 16Bit
5040-09421-00	C52	Cap., 100μF, 25v, Alum Ax.	5551-09822-00	Y1	Crystal 10MHz Parallel resonant
5040-13417-00	C20, C21	Cap., 10,000μF, 35v, Alum.	5700-12047-00	L1	Inductor, 4.7μH, 3Amp.
5041-09009-00	C36, C44	Cap., 22μF, 10v, Tant Alum	5700-12088-00	U16	IC, Socket 24-Pin .300 DIP
5041-13187-00	C22	Cap., 4.7μF, Tant Axial.	5705-12638-00	U2-U9	IC, Socket 32-Pin .600 DIP
5043-08996-00	C4, C5, C10-C13 C31, C35, C38, C43, C46, C47, C50-C79	Cap., .10μF, 50v, Cer Ax.	5733-12060-01	U27, U28	Heatsink 5298-B
5043-10267-00	C37, C45		5791-10862-04	F501, F502	MT3AG PCMountd Fuse Holder
5048-11028-00	C16, C17	Cap., 150pF, 50v, Cer Ax.	5791-10862-05	J1, J2	Connector, 4-pin Header STR .156
5048-11029-00	C48	Cap., 22pF, 50v, Cer Ax.	5791-10862-07	J3	Connector, 5-pin Header STR .156
5048-11030-00	C49	Cap., 100pF, 50v, Cer Ax.	5791-12516-00	J4	Connector, 7-pin Header STR .156
5048-11033-00	C33	Cap., 470pF, 50v, Cer Ax.	A-17002	P1	Connector, 34 Hen 2x17 STR .100
5048-12036-00	C34, C42	Cap., .022μF, 50v, CerAx.	A-5343-50025-S2	U16	PAL Sub-Assembly
5048-13418-00	C30, C39, C40	Cap., .22μF, 50v, Cer Ax.	A-5343-50025-S3	U2	ROM Sub-Assembly
5048-13608-00	C8	Cap., .047μF, 50v, Cer Ax.	A-5343-50025-S4	U3	ROM Sub-Assembly
5048-13609-00	C7, C24, C26	Cap., 6800pF, 50v, Cer Ax.	A-5343-50025-S4	U4	ROM Sub-Assembly
5048-13610-00	C2, C3, C9, C27, C29	Cap., 3900pF, 50v, Cer Ax.	A-5343-50025-S5	U5	ROM Sub-Assembly
5048-13611-00	C6, C23, C25, C28	Cap., 1000pF, 50v, Cer Ax.	A-5343-50025-S6	U6	ROM Sub-Assembly
5070-09045-00	D1-D4	Cap., 680pF, 50v, Cer Ax.	A-5343-50025-S7	U7	ROM Sub-Assembly
		MR-501 Rectifier Diode	Not Used	U8	ROM Sub-Assembly
			Not Used	U9	ROM Sub-Assembly
			5731-10356-00	F501, F502	Fuse, 3Amp, 250v, Slow Blow

# A-15472-1

## Fliptronic II Board Assembly

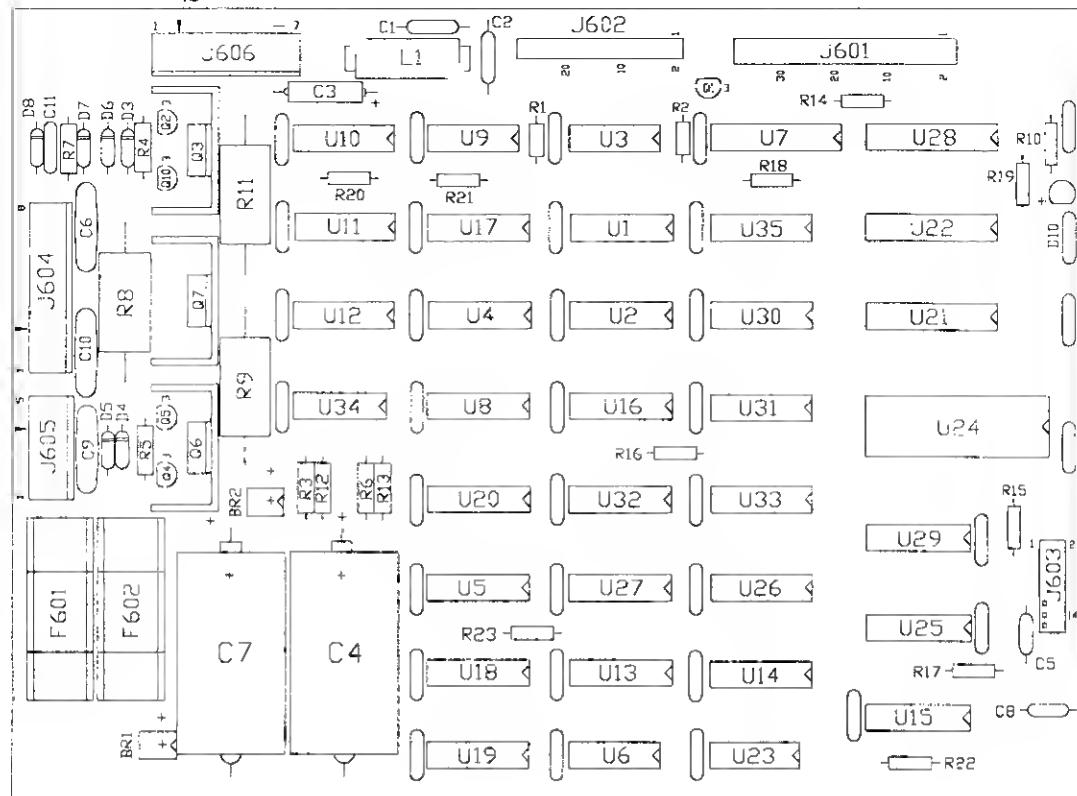


<u>Part Number</u>	<u>Designator</u>	<u>Description</u>	<u>Part Number</u>	<u>Designator</u>	<u>Description</u>
01-10572	Q1-Q4	Heatsink	5070-09054-00	D1-D24	Diode, 1N4004
4006-01003-08	Q1-Q4	Mach. Screw, 6-32	5100-09690-00	BR1	Bridge Rectifier
4406-01128-00	Q1-Q4	Nut 6-32 KEPS	5162-12635-00	Q5-Q12	Trans., TIP102 NPN
5010-09034-00	R37-R44, R53	Res., 10KΩ, 1/4w, 5%	5190-09016-00	Q13, Q20	Trans., 2N4403 PNP
5010-09358-00	R22, R24, R26, R28, R30, R32, R34, R36, R45-R52	Res., 1KΩ, 1/4w, 5%	5191-12179-00	Q1-Q4	Trans., TIP36C PNP
5010-09361-00	R1-R4	Res., 470Ω, 1/4w, 5%	5315-12009-00	U2	IC, 74HCT374
5010-09416-00	R21, R23, R25, R27, R29, R31, R33, R35	Res., 220Ω, 1/2w, 5%	5315-12031-00	U5	IC, 74HCT244
5010-09534-00	W3, W4	Res., 0Ω	5315-12812-00	U1	IC, 74HCT138
5010-10171-00	R13, R20	Res., 56Ω, 1/4w, 5%	5315-12951-00	U3	IC, 74HCT00
5011-12956-00	R5, R12	Res., 2.7KΩ, 1w, 5%	5370-12272-00	U4, U6	IC, LM339 Quad Comp
5040-08986-00	C1	Cap., 100µF, 10v	5731-10356-00	F901-F904	Fuse S-B, 3A., 250v
5040-09537-00	C2	Cap., 100µF, 100v	5733-12060-01		Fuse Holder (F901-F904)
5043-08980-00	B	Cap., .01µF, 50v	5791-10862-05	J901, J904	Connector, 5-pin Header
			5791-10862-09	J907	Connector, 9-pin Header
			5791-10862-13	J902	Connector, 13-pin Header
			5791-13830-06	J905, J906	Connector, Str Sq. Pin Hdr.
			5791-12516-00	J903	34 Hen 2 x 17 STR

**A-14039.1**  
**Dot Matrix Assembly**

Q3  
Q7  
BUV27P

Q10 "2N5551"  
Q4 "2N5401"



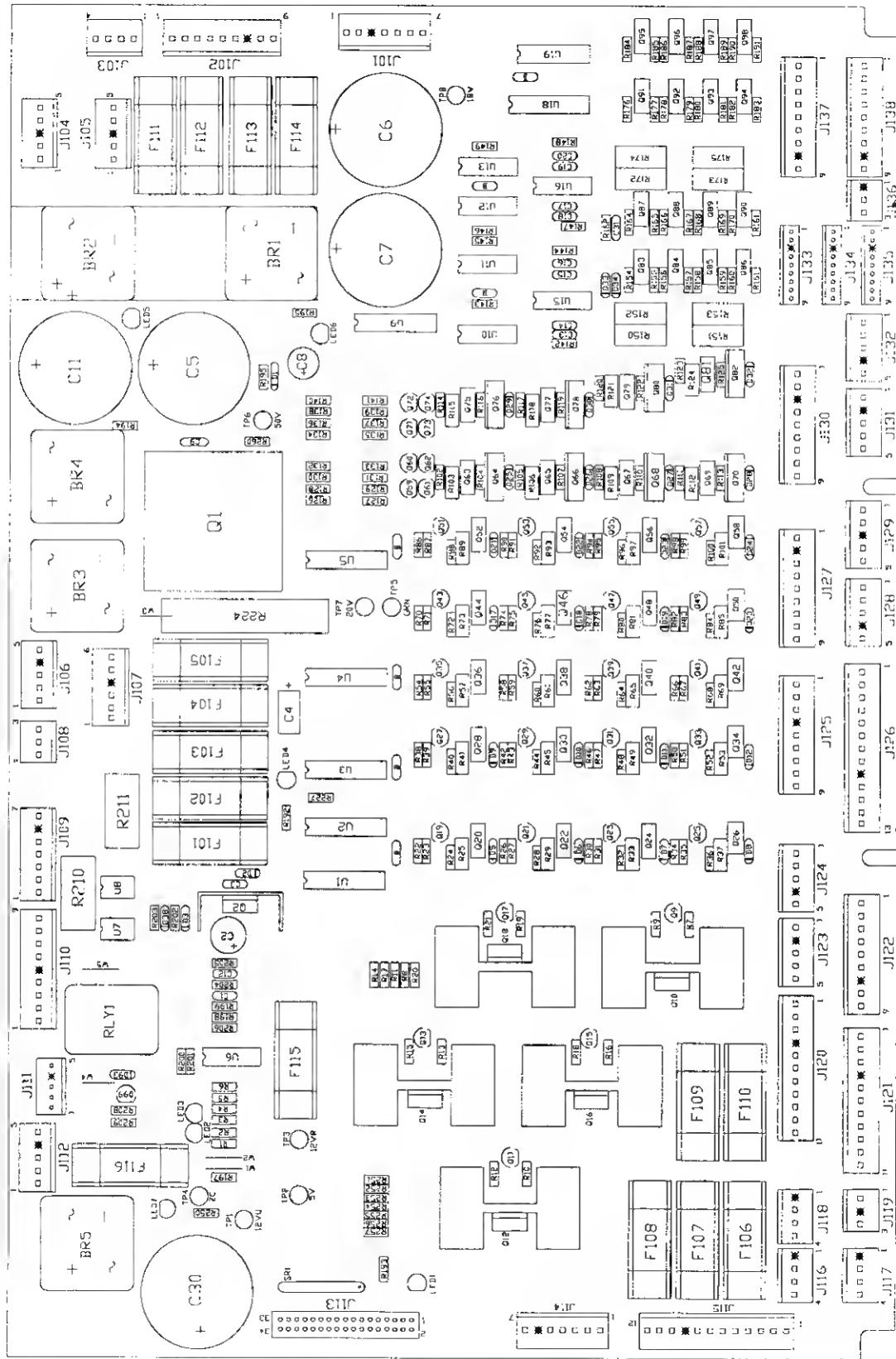
Part Number	Designator	Description	Part Number	Designator	Description
5010-08991-00	R1	Res., 4.7KΩ, 1/4w, 5%	5311-10946-00	U4, U5, U17,	IC, 74HC74
5010-09036-00	R14-R23	Res., 100Ω, 1/4w, 5%		U18, U20	
5010-09224-00	R10	Res., 270Ω, 1/4w, 5%	5311-10947-00	U9	IC, 74HC125
5010-12832-00	R3, R6, R12, R13	<del>Res., 4.7KΩ, 1/4w, 5% - 47K</del>	5311-10951-00	U10, U11	IC, 74HC161
5010-12841-00	R4, R5	Res., 120Ω, 1/2w, 5%	5311-10977-00	U6	IC, 74HC04
5012-12830-00	R9	Res., 1.8KΩ, 5w, 5%	5311-12817-00	U29	IC, 74HC165
5012-12842-00	R11	Res., 120Ω, 5w, 5%	5311-12819-00	U21	IC, 74HC688
5012-12843-00	R8	Res., 4.7KΩ, 5w, 5%	5311-12820-00	U23	IC, 74HC27
5010-10171-00	R7	Res., 56Ω, 1/4w, 5%	5311-12822-00	U13-U15	IC, 74HC193
5043-09492-00	C5, C8	Cap., 100P, 50v, (±10%)	5315-12009-00	U22	IC, 74HCT374
5040-08986-00	C3	Cap., 100M, 10v (±20%)	5315-12812-00	U1, U2, U30, U12	IC, 74HCT138
5040-12324-00	C4, C7	Cap., 150M, 160v (±50%)	5281-09308-00	U28	IC, 74HCT245
5043-08980-00	BYPASS	Cap., .01M, 50v (+80,-20%)	5315-12815-00	U8, U34	IC, 74HCT08
5043-09072-00	C6, C9, C10	Cap., .1M, 500v (+80,-20%)	5315-12816-00	U19	IC, 74HCT32
5043-09845-00	C1, C2, C11	Cap., 1KP, 50v (±20%)	5315-12821-00	U7	IC 74HCT240
5070-09054-00	D7	Diode, 1N4004, 1.0A.	5340-12278-00	U24	S/RAM 2064 150NS
5075-12824-00	D6, D8	Zener, 1N4742A, 12v	5551-09822-00	L1	Ind. 4.7μH, 3A.
5075-12823-00	D4, D5	Zener, 1N4758, 56v	5671-14516-00	D10	Display LED Red
5075-12826-00	D3	Zener, IN4759A, 62v	5705-09199-00	Q3, Q6, Q7	Heatsink, 6030B
5100-12833-00	BR1, BR2	Bridge, 400v, 1A	5731-12328-00	F601, F602	Fuse, 3/8A., SB, 250v
5150-10269-00	Q1	Trans., 2N3904 NPN	5733-12060-01		Fuse Holder (F601, F602)
5164-09056-00	Q2, Q10	Trans., MPSD02 NPN	5791-10850-00	J602	Connector, 26-pin Header
5164-12154-00	Q3, Q7	Trans., MJE15030 NPN	5791-10862-05	J605	Connector, 5-pin Header
5194-09055-00	Q4, Q5	Trans., MPSD52 PNP	5791-10862-07	J606	Connector, 7-pin Header
5194-12155-00	Q6	Trans., MJE15031 PNP	5791-10862-08	J604	Connector, 8-pin Header
5281-09738-00	U16, U25-U27	IC, 2N3904 NPN	5791-12516-00	J601	34 Hen 17x2 STR
5281-10033-00	U3	IC, 74LS157	5791-12827-00	J603	14 Hen 7x2 STR
5281-10043-00	U31-U33, U35	IC, 74LS30			
		IC, 74LS175			

# A-12697-3

## WPC Power Driver Assembly

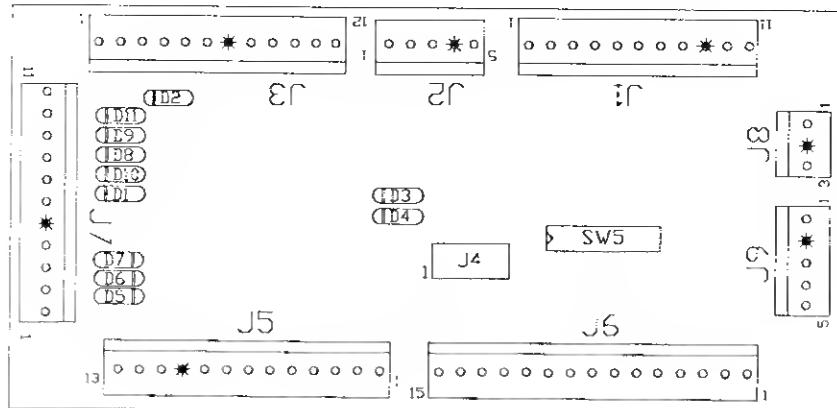
Part Number	Designator	Description	Part Number	Designator	Description
5010-08981-00	R260	Res., 10KΩ, ½w, 5%	5040-12313-00	C5-C7, C11, C30	Cap., 15KM, 25v (±20%)
5010-08991-00	R9, R12, R15, R18, R21, R23, R27, R31, R35, R39, R43, R47, R51, R55, R59, R63, R67, R71, R75, R79, R83, R87, R91, R95, R99, R126, R128, R130, R132, R134, R136, R138, R140, R227	Res., 4.7KΩ, ¼w, 5%	5043-08980-00	B-BYPASS	Cap., .01M, 50v (+80, -20%)
			5043-08996-00	C13-C20, C31	Cap., .1M, 50v (±20%)
			5043-09845-00	C1, C12	Cap., 1KP, 50v (±20%) Axial
			5048-10994-00	C3	Cap., .33M, 50v (±20%) Axial
			5070-08919-00	D33, D34	Diode 1N4148, 150MA.
			5070-09054-00	D1-D3, D5-D12, D17-D32, D38	Diode 1N4004, 1.0A.
			5100-09690-00	BR1-BR5	Bridge, 35A, Rect, 200V
			5131-12725-00	Q10, Q12, Q14, Q16, Q18	Triac BT138E
5010-08992-00	R8, R11, R14, R17, R20, R177, R179, R181, R183, R185, R187, R189, R191	Res., 560Ω, ¼w, 5%	5162-12422-00	U19	IC ULN 2803 OC-DRL
			5162-12635-00	Q20, Q22, Q24, Q26, Q28, Q30, Q32, Q34, Q36, Q38, Q40, Q42, Q44, Q46, Q48, Q50, Q52, Q54, Q56, Q58, Q63, Q65, Q67, Q69, Q75, Q77, Q79, Q81, Q83-Q90	Transistor, TIP 102
5010-08993-00	R25, R29, R33, R37, R41, R45, R49, R53, R57, R61, R65, R69, R73, R77, R81, R85, R89, R93, R97, R101, R103, R106, R109, R112, R115, R118, R121, R124	Res., 68KΩ, ½w, 5%	5194-09055-00	Q9, Q11, Q13, Q15, Q17, Q19, Q21, Q23, Q25, Q27, Q29, Q31, Q33, Q35, Q37, Q39, Q41, Q43, Q45, Q47, Q49, Q51, Q53, Q55, Q57, Q59-Q62, Q71-Q74	Transistor, 2N5401 PNP
5010-08997-00	R24, R28, R32, R36, R40, R44, R48, R52, R56, R60, R64, R68, R72, R76, R80, R84, R88, R92, R96, R100, R102, R105, R108, R111, R114, R117, R120, R123	Res., 2.7KΩ, ¼w, 5%	5191-12179-00	Q64, Q66, Q68, Q70, Q76, Q78, Q80, Q82	Transistor, TIP36C PNP
5010-08998-00	R155, R157, R159, R161, R165, R167, R169, R171	Res., 2.2KΩ, ¼w, 5%	5192-12428-00	Q91-Q98	Transistor, TIP 107
			5260-12634-00	Q1	Reg LM 323 5v
			5281-09486-00	U1-U5, U18	IC, 74LS374 8D F/F
			5281-09487-00	U10-U13	IC, 74LS74 Dual D F/F
5010-09034-00	R142-R149, R197-R198	Res., 10KΩ, ¼w, 5%	5281-10182-00	U9	IC, 74LS240 L/Drv.
5010-09085-00	R194, R196, R251, R253-R257	Res., 1.5KΩ, ¼w, 5%	5370-12272-00	U6, U15, U16	IC, LM339 Quad Comp.
5010-09086-00	R252	Res., 6.8KΩ, ¼w, 5%	5460-12423-00	Q2	IC, LM7812
5010-09224-00	R192, R202-R205	Res., 270Ω, ¼w, 5%	5871-14516-00	LED1, LED4-LED7	Display LED Red
5010-09314-00	R176, R178, R180, R182, R184, R186, R188, R190	Res., 1.2K, ¼w, 5%	5701-09652-00	Q1	Thermal Pad
5010-09324-00	R206		5705-09199-00	Q2	Heatsink 6030B
5010-09358-00	R154, R156, R158, R160, R162, R164, R168, R168, R170, R193, R199, R250	Res., 27KΩ, ¼w, 5% Res., 1KΩ, ¼w, 5%	5705-12637-00	Q1	Heatsink 5054
5010-09361-00	R104, R107, R110, R113, R116, R119, R122, R125	Res., 220Ω, ½w, 5%	5705-12638-00	Q10, Q12, Q14, Q16, Q18	Heatsink 5298B
5010-09416-00	R22, R26, R30, R34, R38, R42, R46, R50, R54, R58, R62, R66, R70, R74, R78, R82, R86, R90, R94, R98, R127, R129, R131, R133, R135, R137, R139, R141	Res., 470Ω, ¼w, 5%	5733-12060-01	F101-F116	Fuse Holder PC MT3AG
			5791-10862-03	J108, J119, J136	Connector, 3-pin Header .158
			5791-10862-04	J103, J116-J118	Connector, 4-pin Header .156
			5791-10862-05	J104-J106, J112, J123, J124, J128, J129, J131, J132	Connector, 5-pin Header .158
			5791-10862-06	J107	Connector, 6-pin Header .156
			5791-10862-07	J101, J109, J114	Connector, 7-pin Header .156
			5791-10862-09	J102, J122, J125, J127, J130, J137, J138	Connector, 9-pin Header .156
			5791-10862-11	J120, J121	Connector, 11-pin Header .156
			5791-10862-12	J115	Connector, 12-pin Header .156
			5791-10862-13	J126	Connector, 13-pin Header .156
			5791-13830-05	J111	Connector, 5-pin Header
			5791-13830-09	J133-J135	Connector, 9-pin Header
			5791-12516-00	J113	34 Hen 2x17 STR
5010-11079-00	R7, R10, R13, R16, R19	Res., 51Ω, ¼w, 5%	5824-09248-00	TP1-TP8	Test Point #1502-1
5010-12427-00	R150-R153, R172-R175	Res., .22Ω, 1w, 5%	5041-09163-00	C9	Cap., 2.2MF Tant
5012-12632-00	R224		5730-09071-00	F114	Fuse, 8A, 32v
5019-10143-00	SR1	Res., .12Ω, 10w, 5%	5731-09432-00	F112	Fuse, S-B, 7A, 250v
5040-08986-00	C4	SIP 470Ω, 9R, 10-pin, 5%	5731-09651-00	F106-F111, F113	Fuse, S-B, 5A, 250v
5040-09421-00	C2	Cap., 100M, 10v (±20%)	5731-10356-00	F101-F105, F116	Fuse, S-B, 3A, 250v
5040-09537-00	C8	Cap., 100M, 25v (+50, -10%) Cap., 100M, 100v (±20%)	5730-09797-00	F115	Fuse, S-B, 3/4A, 250v
			5705-12698-00		Heatsink #62365

**A-12697-3**



# A-17051-1

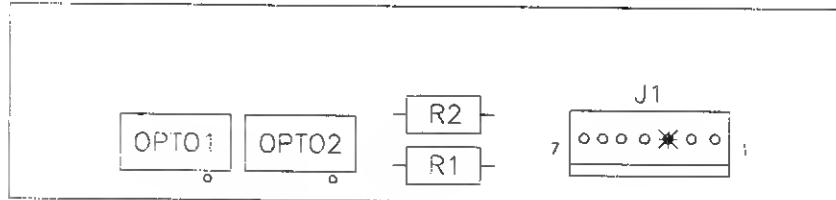
## Coin Door Interface PCB Assembly



<u>Part Number</u>	<u>Designator</u>	<u>Description</u>
5791-10862-03	J8	Connector, 3-pin Header Str. Sq.
5791-10862-05	J2, J9	Connector, 5-pin Header Str. Sq.
5791-10862-11	J1, J7	Connector, 11-pin Header Str. Sq.
5791-10862-12	J3	Connector, 12-pin Header Str. Sq.
5791-10862-13	J5	Connector, 13-pin Header Str. Sq.
5791-10862-15	J6	Connector, 15-pin Header Str. Sq.
5791-11000-10	J4	Connector, 10-pin Header Str. Sq.
5645-09025-00	SW5	Switch DIP 8 Pos.
5070-09054-00	D1 - D11	Diode, 1N4004, 1.0A.

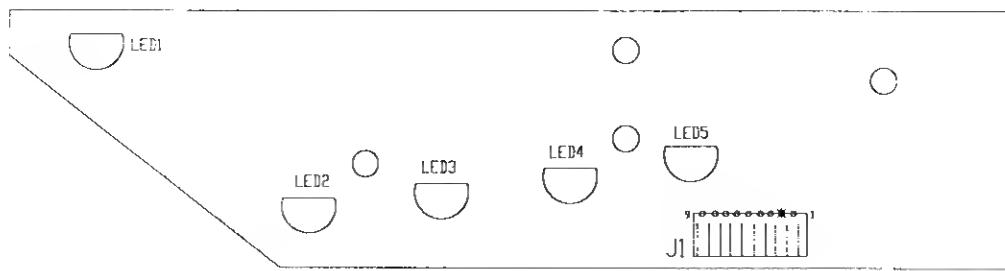
# A-17316

## Flipper Opto PCB Assembly



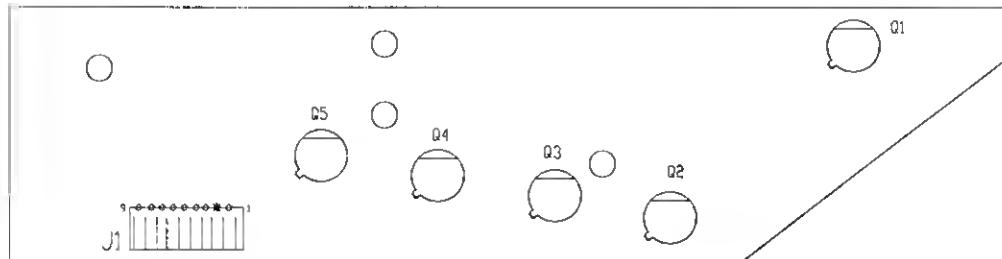
<u>Part Number</u>	<u>Designator</u>	<u>Description</u>
A-16384	-	Flipper Opto Switch PCB
5010-08930-00	R1, R2	Resistor, 470Ω, 1/2w, 5%
5490-12451-00	OPTO1, OPTO2	Opto Interrupter Lg. 10mA.
5791-13830-07 03-9001	J1	Connector, 7-pin Header Solid Sq. Interrupter Flip-Opto

**A-18617-1**  
**Trough IRED LED PCB Assembly**



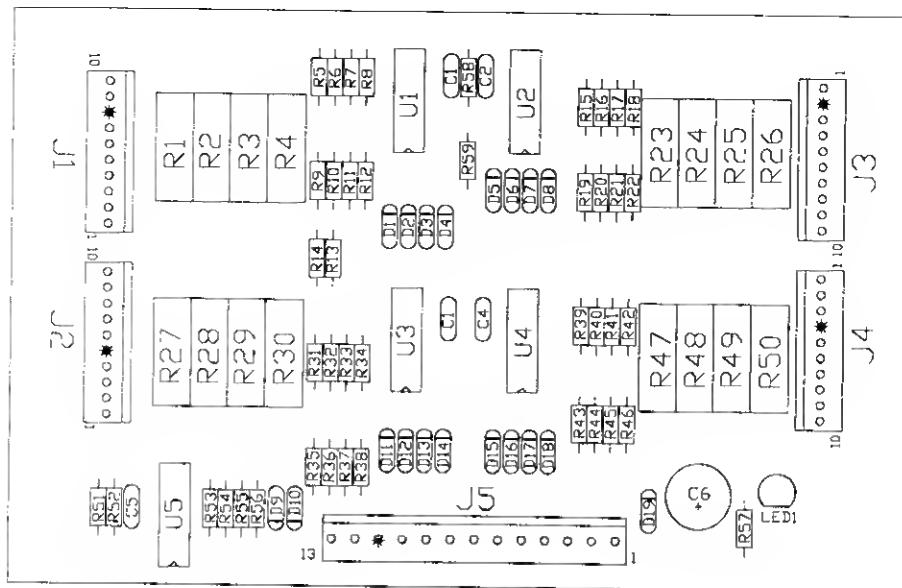
Part Number	Designator	Description
5671-12731-00	LED1 - LED5	Infra Red Diode
5791-12622-09	J1	Connector, 9-pin Header Sq.

**A-18618-1**  
**Trough IRED Transistor PCB Assembly**



Part Number	Designator	Description
5163-14114-00	Q1 - Q5	Infra Red Photo Transistor
5791-12622-09	J1	Connector, 9-pin Header Sq.

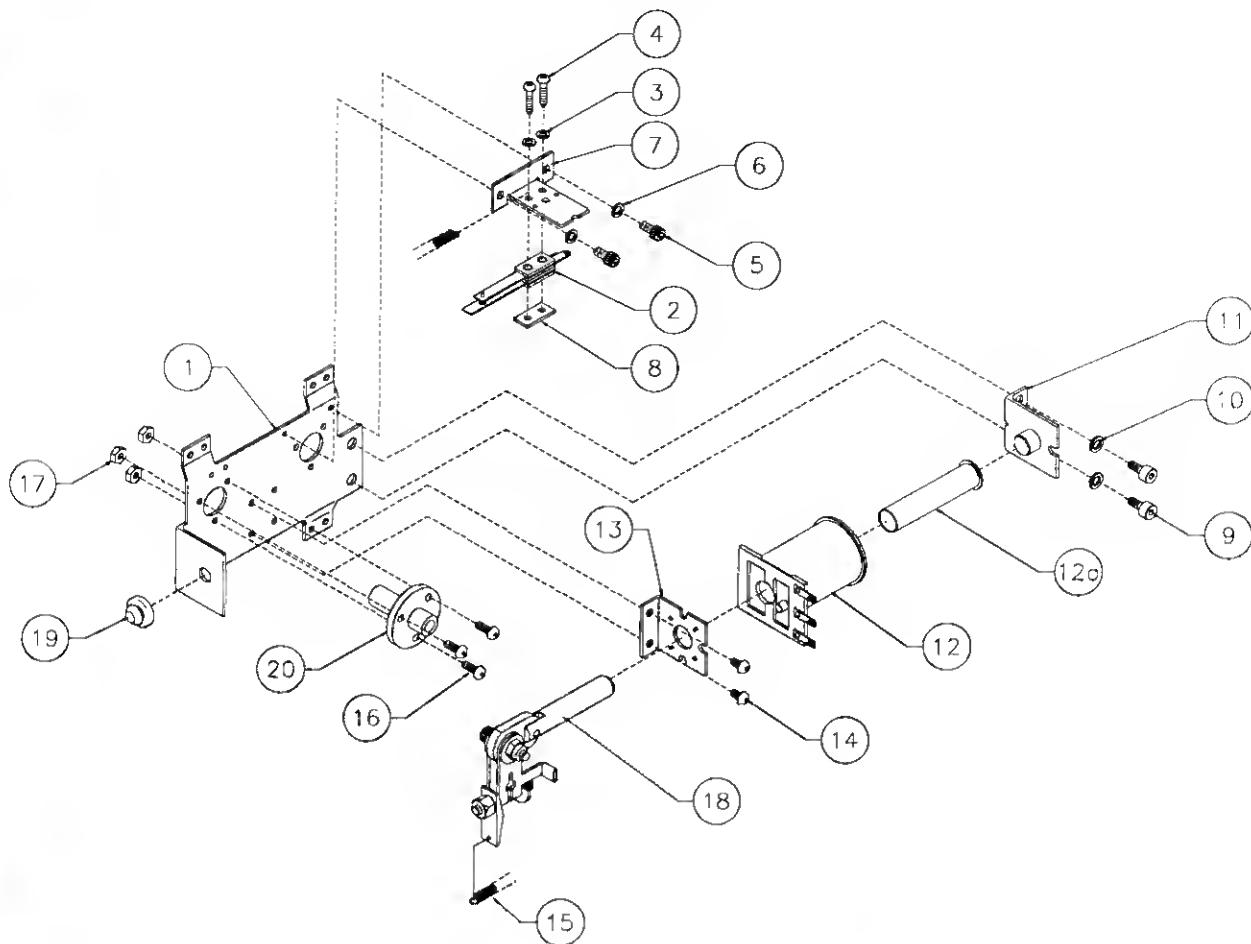
**A-17223**  
**16-Opto PCB & Bracket Assembly**



<u>Part Number</u>	<u>Designator</u>	<u>Description</u>
<b>A-16898.1</b>	-	16-Opto Dual Mount PCB Assy.
5043-08996-00	C1 -C5	Capacitor, 0.1 $\mu$ F, 50v( $\pm 20\%$ ) Axial
5040-13102-00	C6	Capacitor, 470 $\mu$ F, @35v ( $\pm 20\%$ )
5791-13830-10	J1-J4	Connector, 10-pin Header STR Sq.
5791-10862-13	J5	Connector, 13-pin Header STR Sq.
5671-13732-00	LED1	Display LED Red
5010-12928-00	R1-R4, R23-R30, R47-R50	Resistor, 270 $\Omega$ , 2w, 5%
5010-09999-00	R5-R12, R15-R22, R31-R46	Resistor, 2K $\Omega$ , 1/4w, 5%
5010-08774-00	R13, R14, R51	Resistor, 22K $\Omega$ , 1/4w, 5%
5010-09162-00	R52, R54, R56,	Resistor, 100K $\Omega$ , 1/4w, 5%
5010-09034-00	R53, R55	Resistor, 10K $\Omega$ , 1/4w, 5%
5010-10631-00	R57	Resistor, 1.2K $\Omega$ , 1/2w, 5%
5370-12272-00	U1-U5	IC LM339 Quad Comp.
5070-09054-00	D1 - D19	Diode 1N4004 1.0A.
01-20756	-	PCB Mounting Bracket
07-6688-18N	-	Rivet 3/16 x 1/8" Nickel

# A-14876-R-3

## Flipper Assembly



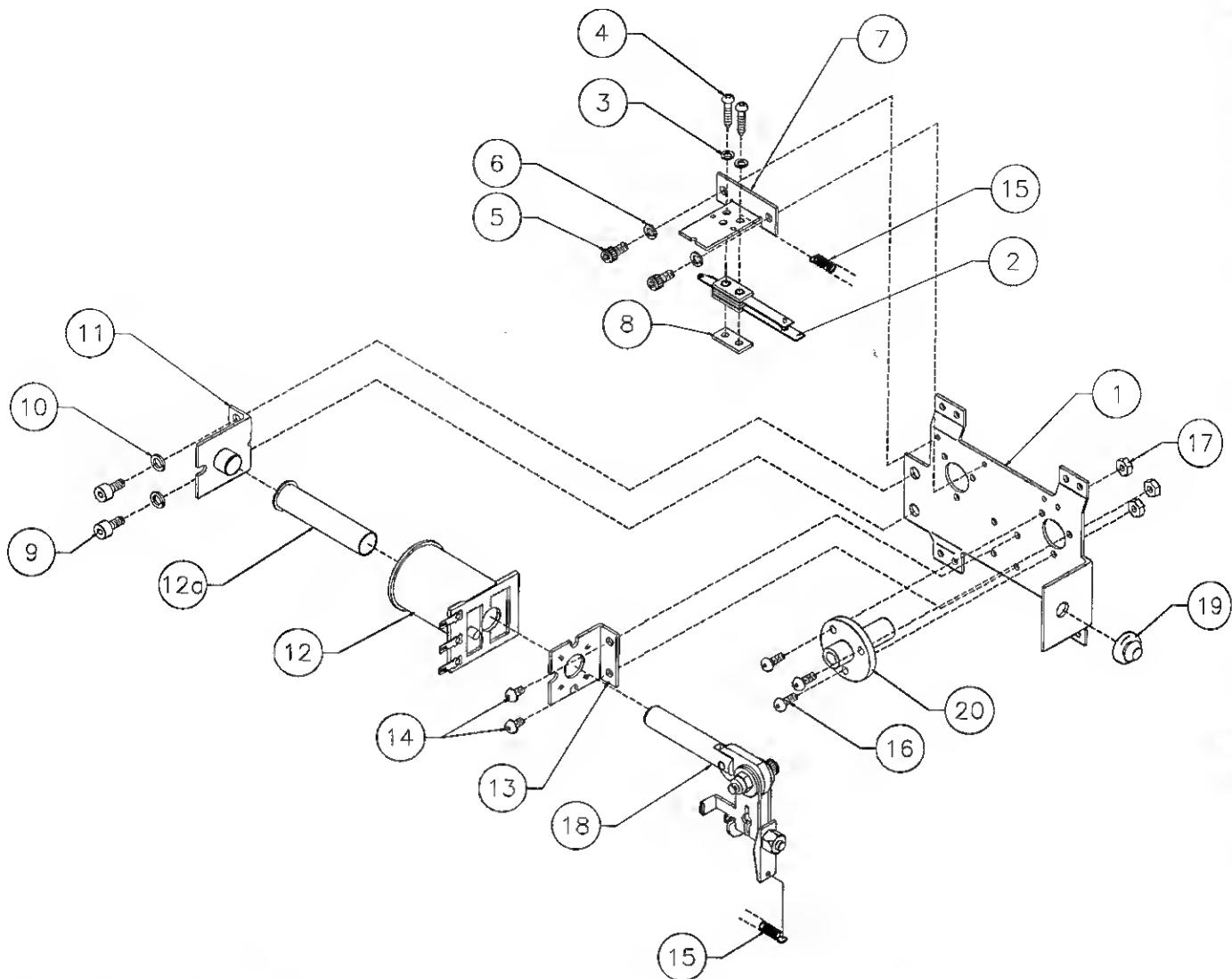
Item	Part Number	Description	Item	Part Number	Description
1	A-14877-R	Flipper Base Assembly, Right	18	A-15848-R	Crank Link Assembly, Right
2	SW-1A-194	Switch Assembly	a)	A-17050-R	Flipper Crank Assembly, Right
3	4701-00002-00	Lockwasher #6 Split	b)	A-15847	Flipper Link Assembly
4	4105-01019-10	Sh. Metal Screw, #5 x 5/8"	c)	02-4676	Link Spacer Bushing
5	4008-01079-05	Mach. Screw, 8-32 x 5/16"	d)	4010-01086-14	Cap Screw, 10-32 x 7/8"
6	4701-00003-00	Lockwasher #8 Split	e)	4700-00023-00	Flat Washer, 5/8 x 13/64 x 16ga.
7	01-9375	Switch Mounting Bracket	f)	4701-00004-00	Lockwasher #10 Split
8	20-6516	Speednut, Tinnerman	g)	4410-01132-00	Nut 10-32 ESN
9	4010-01066-06	Cap Screw, 10-32 x 3/8"	19	23-6577	Bumper Plug, 5/8"
10	4701-00004-00	Lockwasher #10 Split	20	03-7568	Flipper Bushing
11	A-12390	Flipper Stop Assembly			
12	FL-11629	Flipper Coil, Blue			
a)	03-7066-5	Coil Tubing			
13	01-7695	Solenoid Bracket			
14	4006-01017-04	Mach. Screw, 6-32 x 1/4"			
15	10-364	Spring			
16	4006-01005-06	Mach. Screw, 6-32 x 3/8"	21	23-6695	Flipper Rubber Ring, Red
17	4406-01117-00	Nut 6-32 Hex.	22	20-9250-6	Flipper w/Shaft Yellow

### Flipper Notes...

1. Each Flipper Assembly is mounted beneath the playfield, in conjunction with the Plastic Flipper & Shaft, and Flipper Rubber on the upper side of the playfield.
2. With the flipper, in the non-activated position, the E.O.S. Switch contacts must have a gap of .062 ( $\pm .015$ ) inch. When flipper is activated switch must close.
3. Any adjustment of the E.O.S. switch must be made at a minimum distance of 0.25 inch from the switch body.
4. Longer blade of E.O.S. switch must be made straight. Gap adjustment is done by adjusting shorter blade.
5. All moving elements of the assembly must operate freely without any evidence of binding.
6. Apply Loctite™ 245 when reattaching screws to the Flipper Stop Assembly, the Solenoid Bracket, and the Flipper Bushing.

# A-15849-L-2

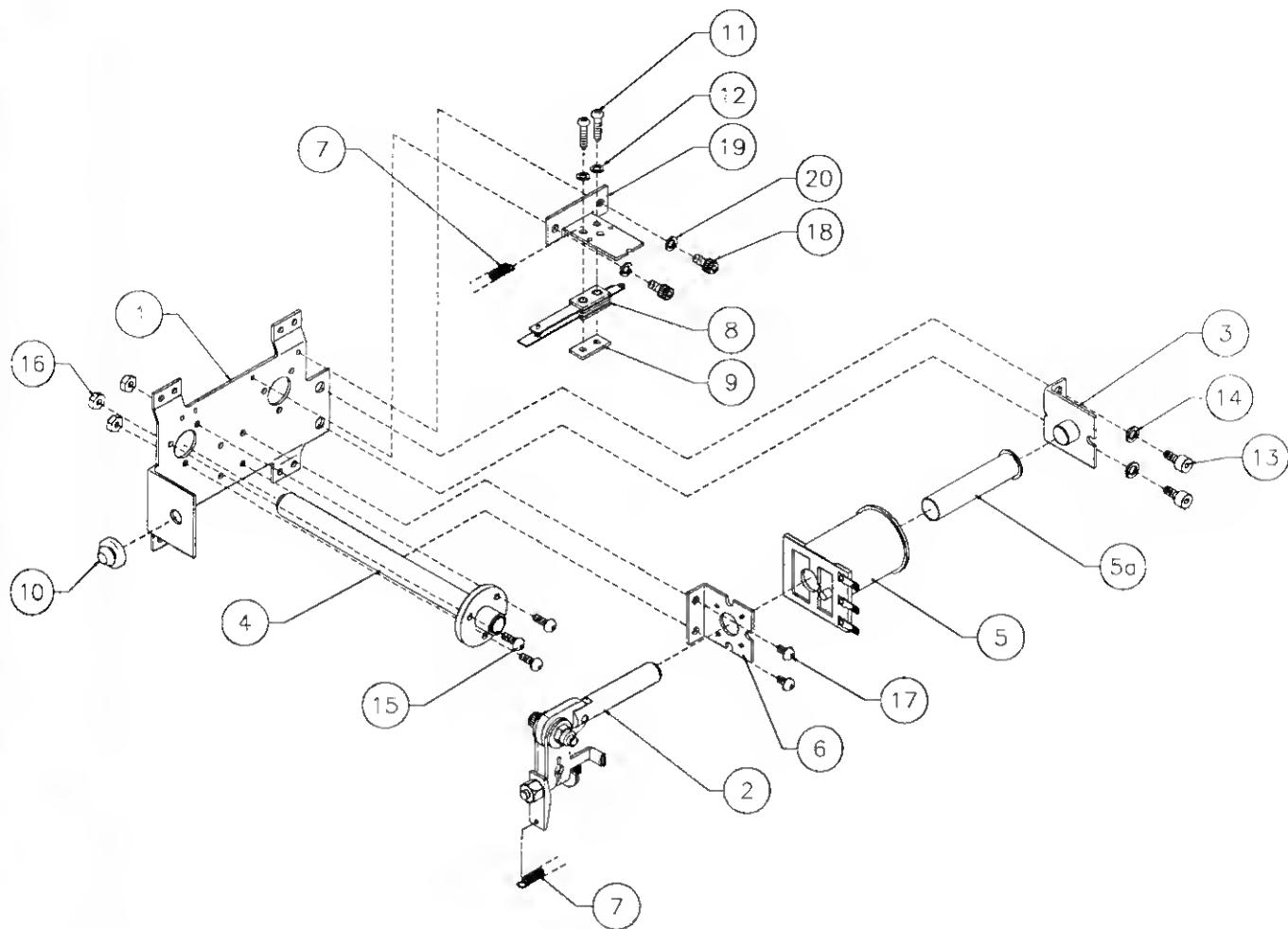
## Flipper Assembly



Item	Part Number	Description	Item	Part Number	Description
1	B-13104-L	Flipper Base Assembly, Left	18	A-15848-L	Crank Link Assembly, Left
2	SW-1A-194	Switch Assembly	a)	A-17050-L	Flipper Crank Assembly, Left
3	4701-00002-00	Lockwasher #6 Split	b)	A-15847	Flipper Link Assembly
4	4105-01019-10	Sh. Metal Screw, #5 x 5/8"	c)	02-4676	Link Spacer Bushing
5	4008-01079-05	Mach. Screw, 8-32 x 5/16"	d)	4010-01086-14	Cap Screw, 10-32 x 7/8"
6	4701-00003-00	Lockwasher #8 Split	e)	4700-00023-00	Flat Washer, 5/8 x 13/64 x 16ga.
7	01-9375	Switch Mounting Bracket	f)	4701-00004-00	Lockwasher #10 Split
8	20-6516	Speednut, Tinnerman	g)	4410-01132-00	Nut 10-32 ESN
9	4010-01066-06	Cap Screw, 10-32 x 3/8"	19	23-6577	Bumper Plug, 5/8"
10	4701-00004-00	Lockwasher #10 Split	20	03-7568	Flipper Bushing
11	A-12360	Flipper Stop Assembly			
12	FL-11629	Flipper Coil, Blue			
a)	03-7066-5	Coil Tubing			
13	01-7695	Solenoid Bracket			
14	4006-01017-04	Mach. Screw, 6-32 x 1/4"			
15	10-364	Spring			
16	4006-01005-06	Mach. Screw, 6-32 x 3/8"			
17	4406-01117-00	Nut 6-32 Hex.			
<b>Associated Parts:</b> (Not Shown)					
			21	23-8895	Flipper Rubber Ring, Red
			22	20-9250-6	Flipper w/Shft, Yellow

# A-19945

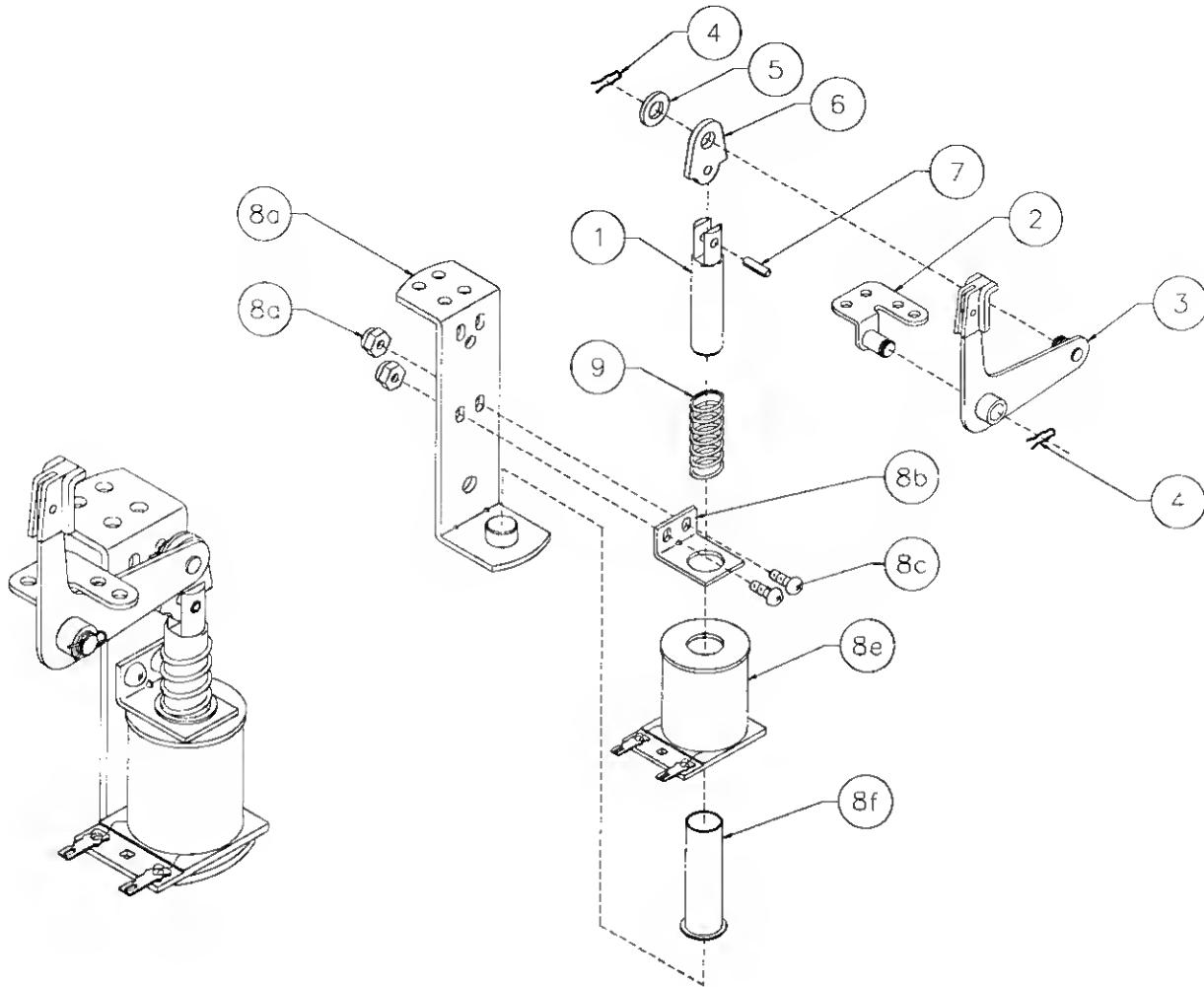
## Flipper Assembly



Item	Part Number	Description	Item	Part Number	Description
1	B-13104-R	Flipper Bracket Sub-Assy.	16	4406-01117-00	Nut 6-32 Hex.
2	A-15848-R	Crank Link Assembly, Right	17	4006-01017-04	Mach. Screw, #6-32x1/4"
3	A-12390	Flipper Stop Bracket Assy.	18	4008-01079-05	Mach. Screw, #8-32x5/16"
4	04-10038	Bushing Sleeve Assembly	19	01-9375	Switch Mounting Bracket
5	FL-11629	Flipper Coil Assembly, Blue	20	4701-00003-00	Lockwasher #8 Split
a)	03-7066-5	Coil Tubing			
6	01-7695	Solenoid Bracket			
7	10-364	Spring			
8	SW-1A-194	Switch Assembly			
9	20-6516	Tinnerman Speednut			
10	23-6577	Plug Bumper	21	23-6695	Flipper Rubber Ring, Red
11	4105-01019-10	Sh. Metal Screw, #5 x 5/8"	22	20-10136.1-6	Flipper w/Shaft-Long (Yellow)
12	4701-00002-00	Lockwasher #6 Split			
13	4010-01066-06	Cap Screw, #10-32 x 3/8"			
14	4701-00004-00	Lockwasher #10 Split			
15	4006-01005-06	Mach. Screw, #6-32 x 3/8"			

**Associated Parts:**  
(Not Shown)

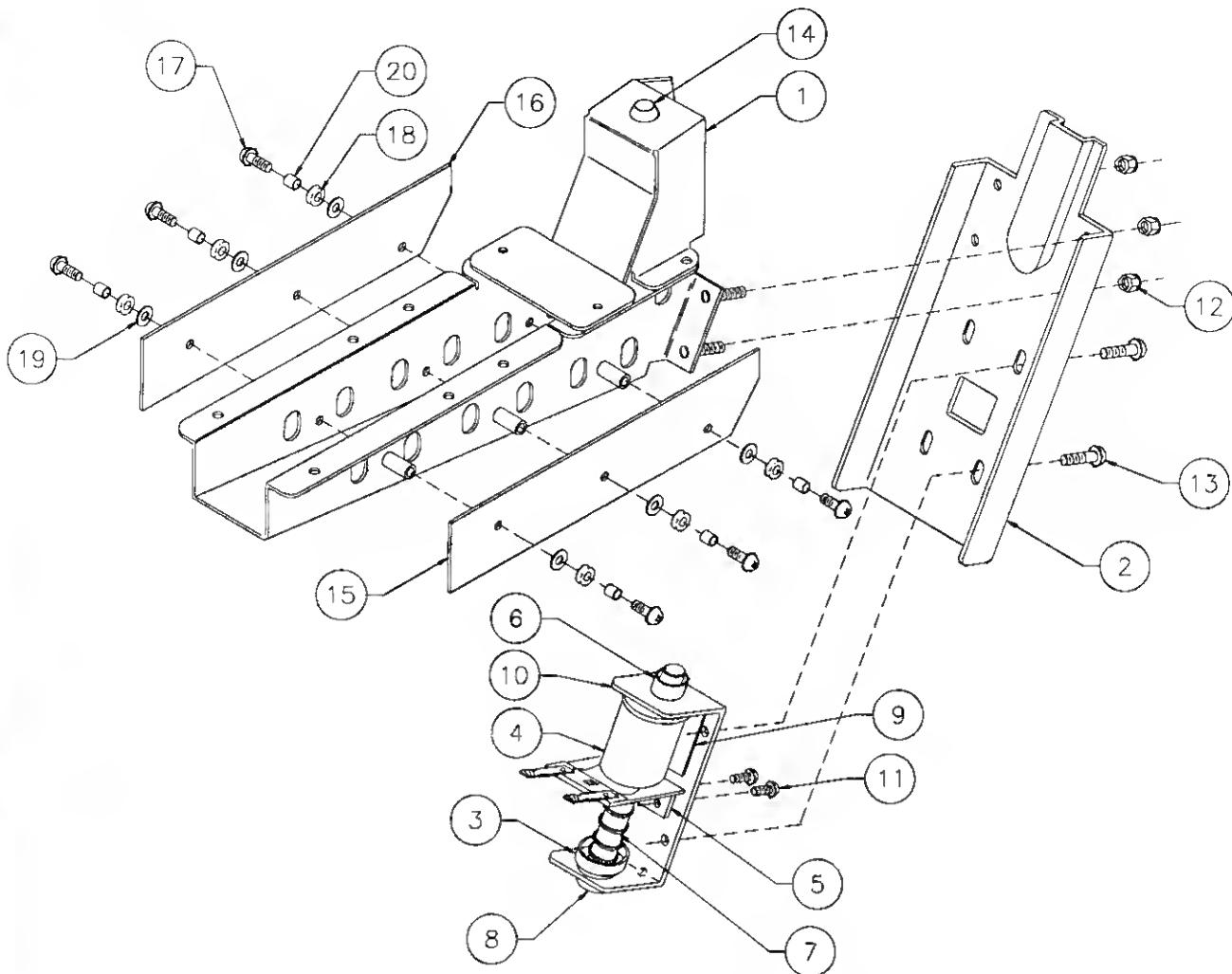
**A-17811**  
**Kicker Arm (Slingshot) Assembly**



**Associated Parts for Right & Left Kickers:**

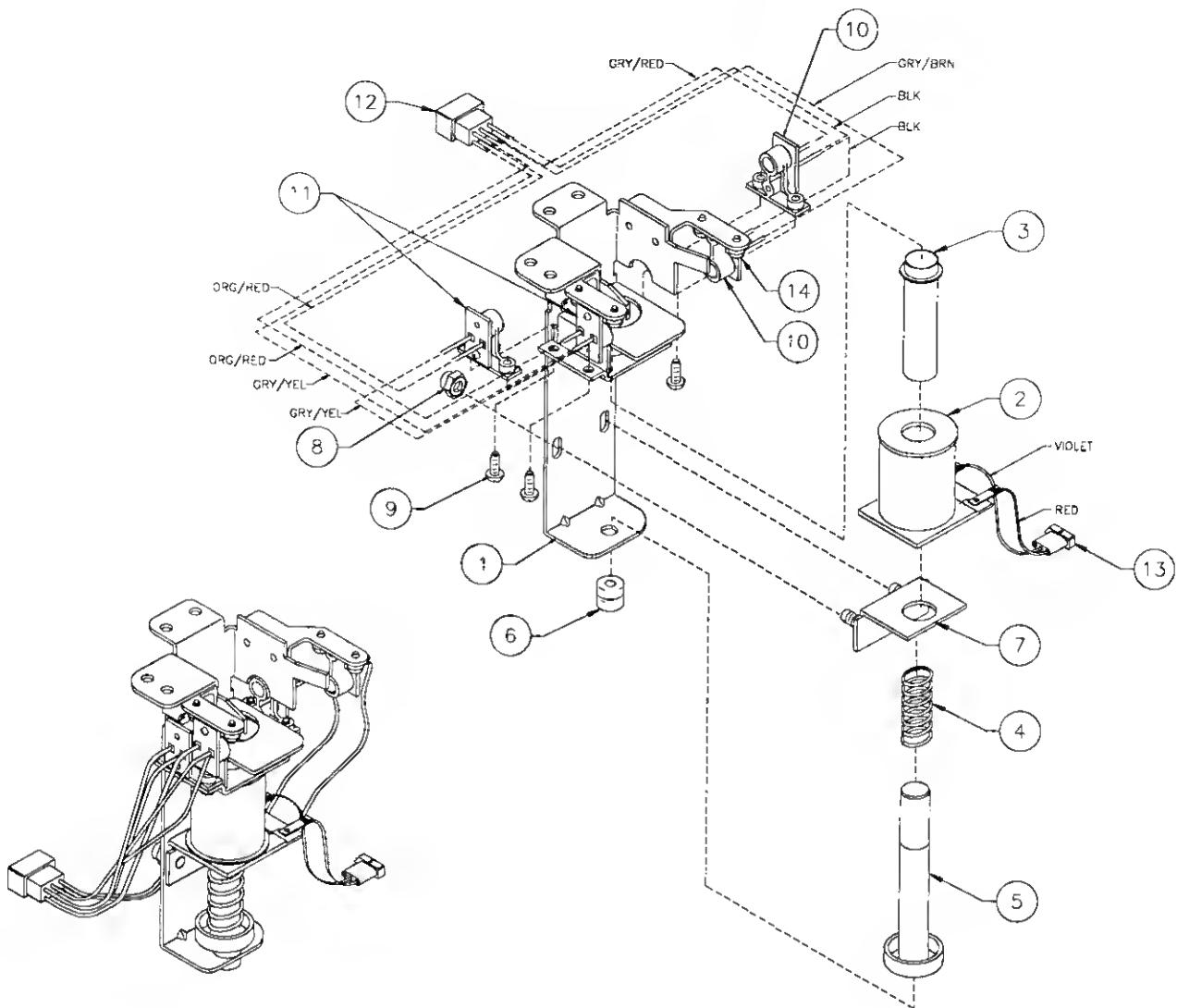
Item	Part Number	Description	Item	Part Number	Description
1	02-2364	Coil Plunger	8	B-9362-L-2	Coil & Bracket Assy., Left
2	A-17810	Mounting Bracket Assembly		B-9362-R-3	Coil & Bracket Assy., Right
3	A-12664	Kicker Crank Assembly	a)	A-17808	Bracket & Stop Assembly
4	12-6227	Hairpin Clip	b)	01-8-508-S	Coil Retaining Bracket
5	4700-00030-00	FW, 17/64 x 1/2 x 15ga.	c)	4006-01017-06	Mach. Screw, 6-32 x 3/8"
6	03-8085	Armature Link	d)	4406-01119-00	Nut, 6-32 ESN
7	20-8716-5	Roll Pin, 1/8 x 7/16"	e)	AE-26-1200	Coil Assembly
			f)	03-7066	Coil Tubing
			9	10-128	Spring

**A-19963**  
**Outhole Ball Trough Assembly**



Item	Part Number	Description	Item	Part Number	Description
1	A-16809-2	Ball Trough Welded Assy.	11	4008-01017-05	Mach. Screw, 8-32 x 5/16"
2	01-11587	Ball Trough Front	12	4408-01119-00	Nut 8-32 ESN
3	A-6306-2	Bell Armature Assembly	13	4008-01017-06	Mach. Screw, 8-32 x 3/8"
4	AE-26-1500	Coil Assembly	14	23-6702	Bumper Plug
5	01-8-508-T	Solenoid Assembly	15	A-18617-1	Trough IRED LED PCB Assembly
6	03-7067-5	Coil Tubing	16	A-18618-1	Trough IRED Transistor PCB Assy.
7	10-135	Spring	17	4006-01003-10	Mach. Screw, 6-32 x 5/8" SEMS
8	23-6420	Rubber Grommet	18	23-6626	Rubber Grommet
9	03-8523	Insulator	19	4700-00004-00	Flat Washer, 9/64 x 7/16 x 21ga.
10	01-11586	Coil Mounting Bracket	20	02-4975	Bushing

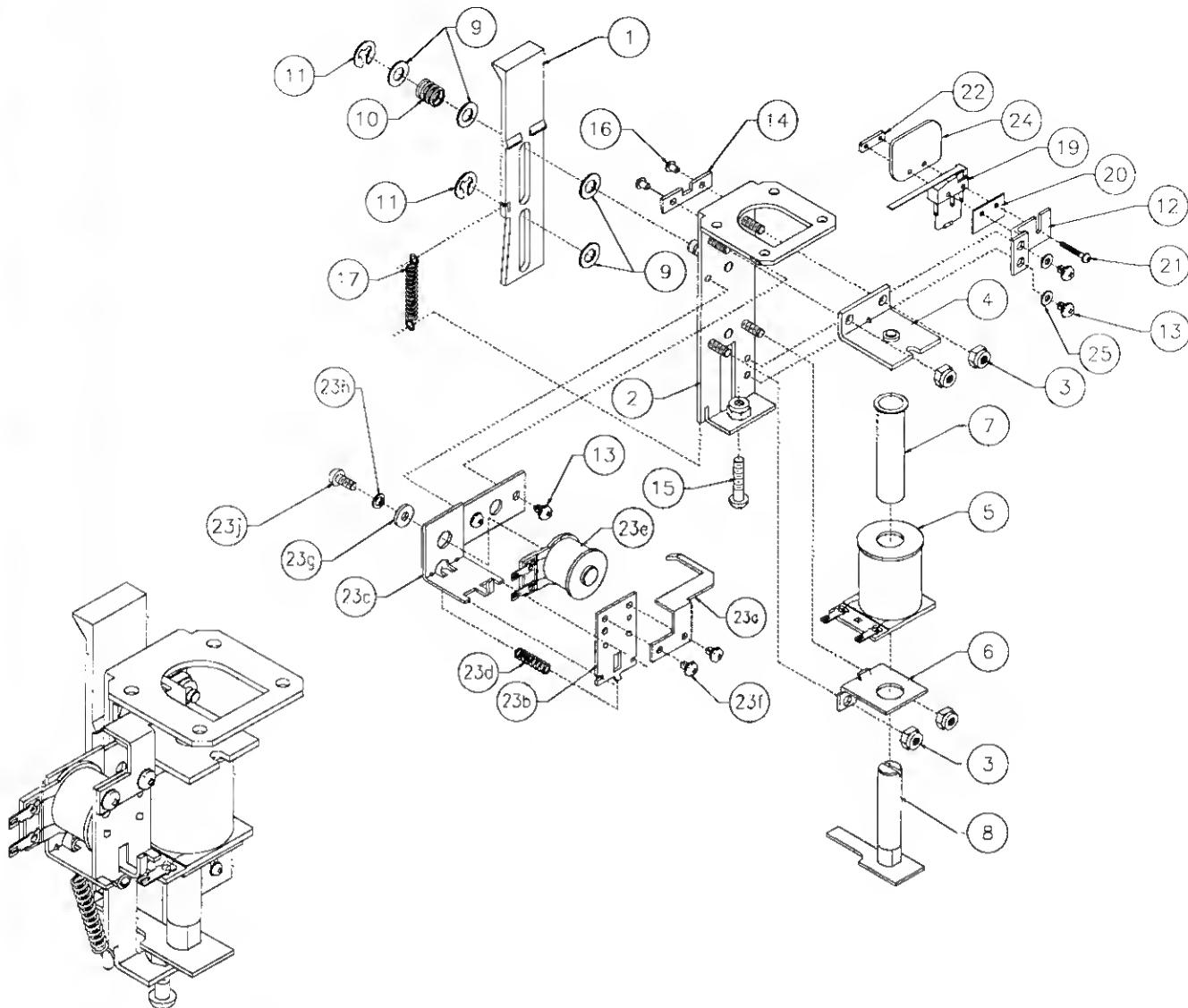
**A-19965**  
**Ball Popper Assembly**



Item	Part Number	Description
1	04-10013	Ball Popper Sub-Assembly
2	AE-23-800	Coil Assembly
3	03-7067-5	Coil Tubing
4	10-135	Solenoid Spring
5	A-17767	Bell Armature Assembly
6	23-6420	Rubber Grommet
7	A-16858	Mounting Bracket
8	4408-01119-00	Nut #8-32 ESN
9	4106-01013-06	Sh. Metal Screw, #6 x 3/8"
10	A-16908	LED Assembly - RTV (2)
11	A-16909	Photo Transistor Assy. - RTV (2)
12	H-20157	Cable
13	H-19523	Cable
14	4004-01003-05	Mach. Screw, #4-40 x 5/16"

# A-14615

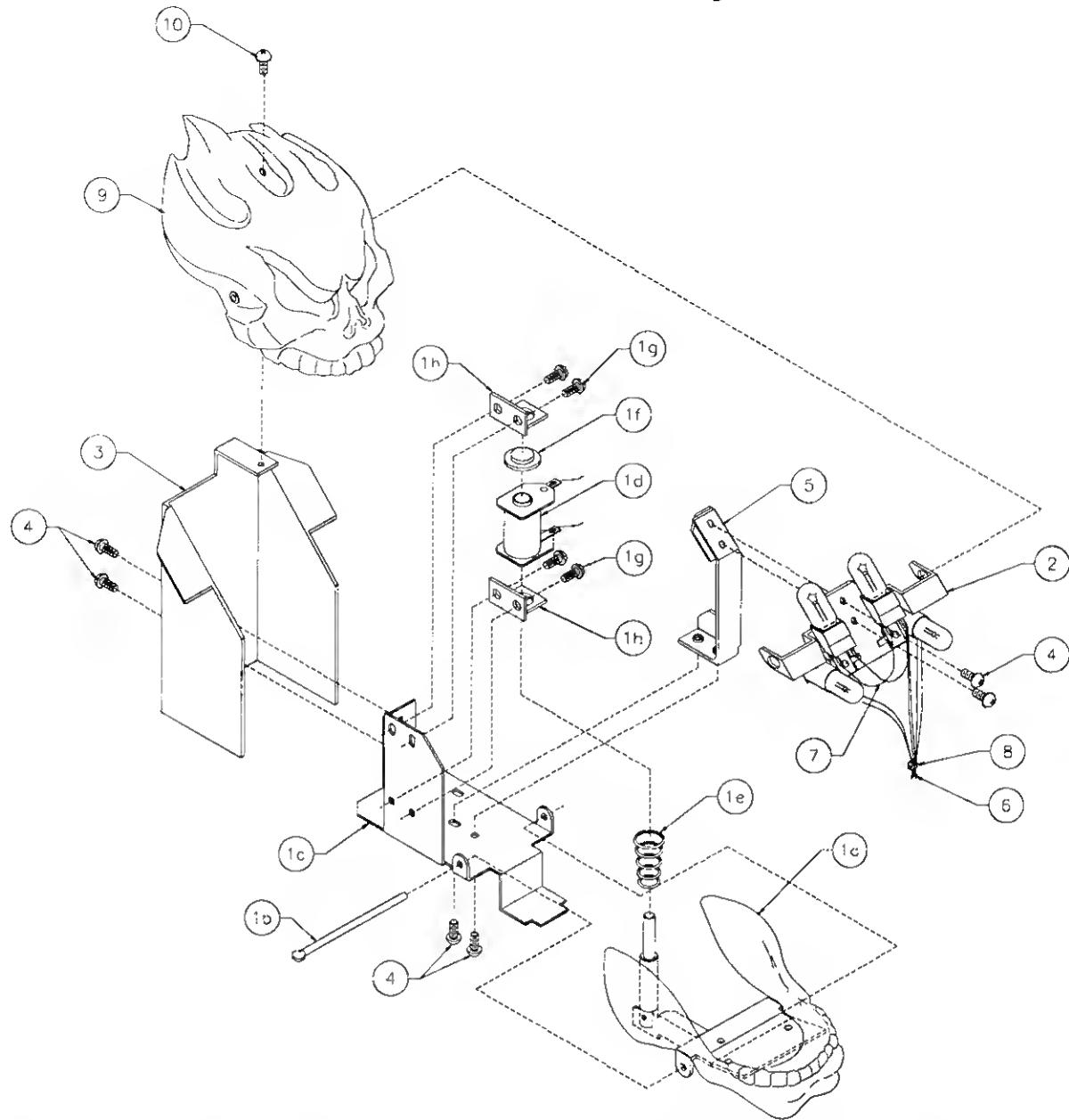
## 1-Bank Drop Target Assembly



Item	Part Number	Description	Item	Part Number	Description
1	03-8750	Target, Flush	18	5070-09054-00	Diode 1N4001
2	A-14617	Bracket & Post Assembly	19	5647-12693-31	Mini Micro Switch
3	4408-01119-00	Nut #8 ESNA	20	01-8600	Switch Insulator
4	A-11397	Stop Bracket Assembly	21	4002-01105-10	Mach. Screw, 2-56 x 5/8"
5	AE-26-1200	Coil Assembly	22	01-8240	Nut Plate
6	01-8413	Bracket & Coil Mounting	23	A-14908	Target K/Down Assembly
7	03-7066-4	Coil Tubing	a)	01-8647-L	Actuator
8	A-11388-2	Plate & Reset Plate Assembly	b)	A-15821	Armature Sub-Assembly
9	4700-00072-00	Flat Washer, 17/64 x 1/2 x 22ga.	c)	A-14913	Frame & Eyelet Assembly
10	10-392	Spring - Compression	d)	10-363	Extension Spring
11	20-8712-25	Truarc "E" Retaining Ring	e)	SM1-26-600	Coil Assembly
12	01-10183	Switch Bracket	f)	4006-01003-03	Mach. Screw, 6-32 x 3/16"
13	4006-01003-03	Mach. Screw, 6-32 x 3/16"	g)	4700-00089-00	Flat Washer, 11/64x7/16x16ga.
14	03-8034	Stop Single Target	h)	4701-00003-00	Lockwasher #8 Split
15	4010-01025-14	Mach. Screw, 10-32 x 7/8"	i)	4008-01005-06BR	Mach. Screw, 8-32 x 3/8"
16	07-6688-17N	Rivet, 5/32 x 7/32"	24	03-8630	Actuator Guide
17	10-433	Spring, Extension	25	4700-00003-00	Flat Washer, 1/8 x 9/32 x 21ga.

# A-20144

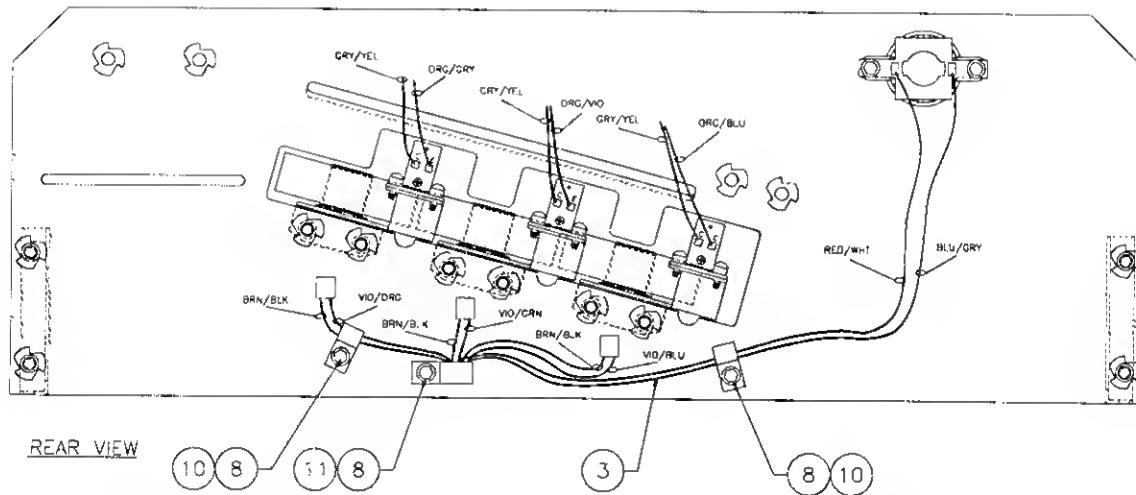
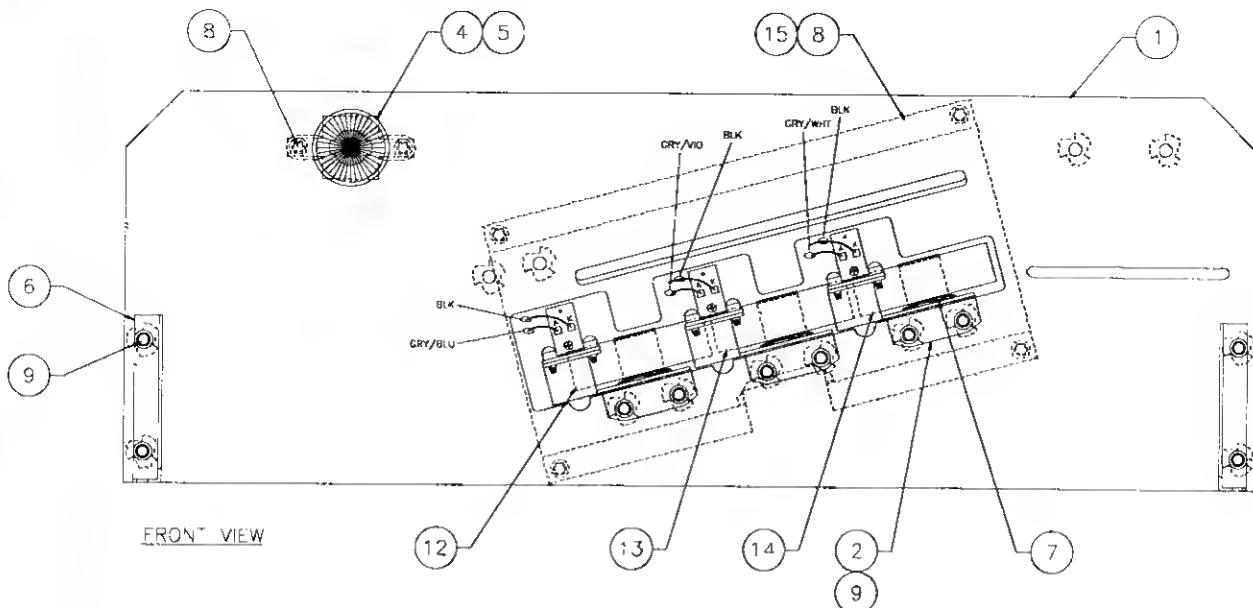
## Skull Base Assembly



Item	Part Number	Description	Item	Part Number	Description
1	A-20143	Skull Pin Assembly	5	04-10064	Lamp Plate Riser
a)	A-20141	Mouth Rivet Assembly	6	H-20164	Cable
b)	02-5176	Skull Pivot Pin	7	17-1116-3	Yellow Jumper 3"
c)	01-13910	Skull Base Plate	8	03-7520-2	Tie-Wrap Nylon 3-7/8"
d)	SM-30-1100-DC	Coil Assembly			
e)	10-424	Spring - Compression			
f)	03-8486	Flange - Centering			
g)	4006-01017-05	Mach. Screw, 6-32 x 5/16"			
h)	A-13735	Coil Bracket Assembly			
2	A-20140	Lamp Plate Assembly	9	A-20142	Skull Assembly
3	04-10098	Back Cover - Skull	10	4006-01017-05	Mach. Screw, 6-32 Phillips
4	4006-01017-05	Mach. Screw, 6-32 x 5/16"			Drive Round Head SEMS

### Associated Assemblies:

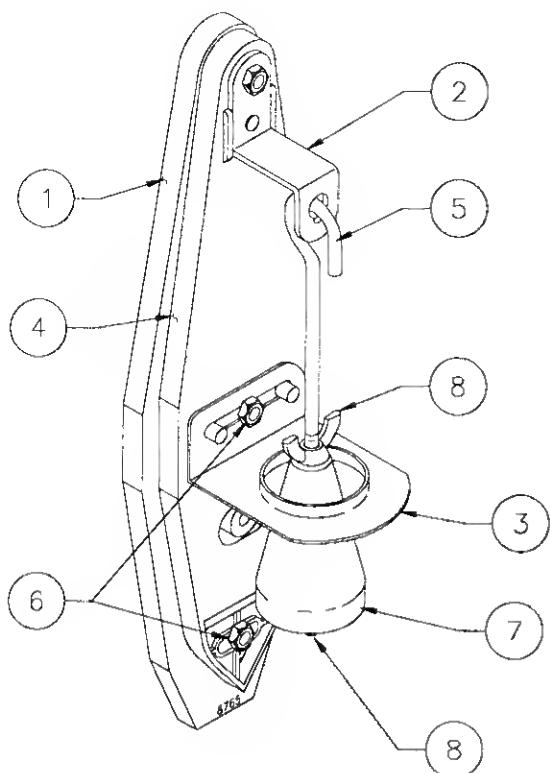
**A-20033**  
**Back Panel Assembly**



Item	Part Number	Description	Item	Part Number	Description
1	04-10052.1	Back Panel - Playfield	9	4008-01113-08	Mach. Screw, #8-32 x 1/2"
2	A-20034	Opto-Mag. Bracket Assy.	10	03-7655-4	Cable Clamp, 1/4"
3	H-20154	Cable	11	03-7655-8	Cable Clamp, 1/2"
4	03-8149-9	Playfield Insert, Tr. Red	12	20-10197	Coil Magnet/Breaker
5	C-13337	Single Flasher Lamp Assy.	13	20-10197-1	Coil Magnet/Breaker
6	01-12569	Gusset Bracket	14	20-10197-2	Coil Magnet/Breaker
7	20-9612	Wave Spring Washer	15	03-9404	Cable Cover
8	4808-01175-08	E-P #8-32 x 1/2" Ind. PI-HWH			

# A-15361

## Tilt Mechanism Assembly



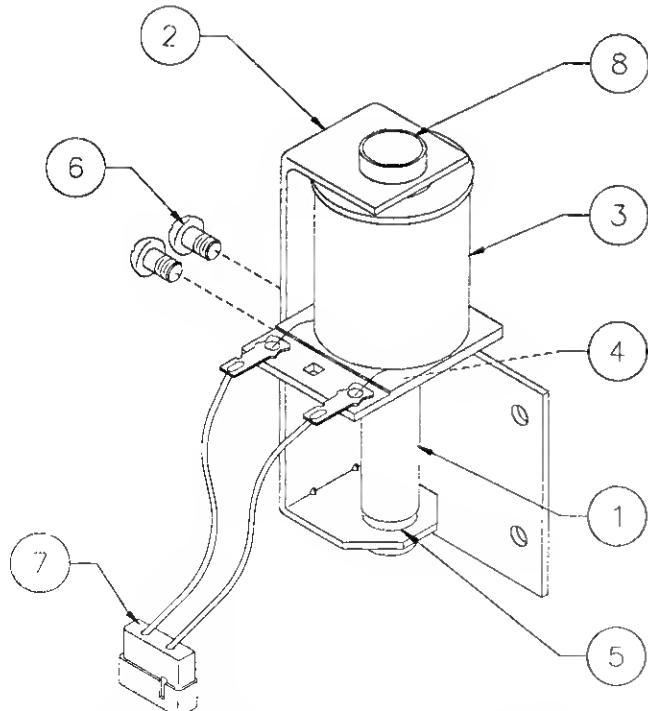
Item	Part Number	Description
1	A-15360	Mount Plate
2	01-3444	Bracket, Tilt Upper
3	01-3445	Bracket, Tilt Lower
4	03-8668	Pendulum
5	12-6231	Plumb Bob Wire
6	4006-01113-06	Mach. Screw, 6-32 x 3/8"

### Associated Parts:

7	20-6502-A	Plumb Bob
8	4406-01120-00	Wing Nut (2)

# B-10686-1

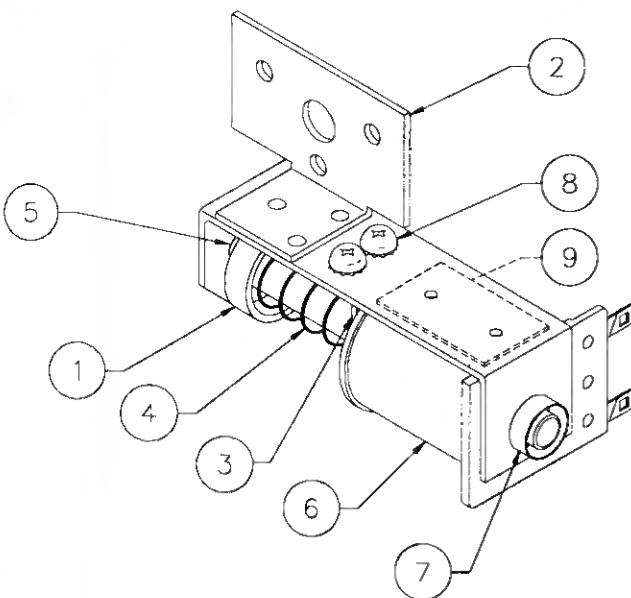
## Knocker Assembly



Item	Part Number	Description
1	A-5387	Coil Plunger Assembly
2	01-11273	Mounting Bracket Assembly
3	AE-23-800	Coil Sub-Assembly
4	01-8-508-T	Coil Retaining Bracket
5	23-6420	Rubber Grommet
6	4008-01017-04	Mach. Screw, 8/32 x 1/4"
7	H-11835	Knocker Cable
8	03-7067-5	Coil Tubing

## A-14525

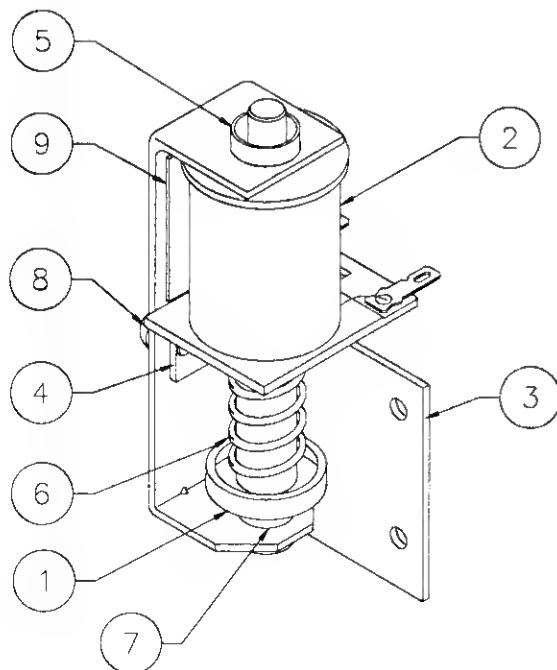
### Kicker Bracket Assembly



<u>Item</u>	<u>Part Number</u>	<u>Description</u>
1	A-6306-2	Bell Armature Assembly
2	A-14526	Kicker Mounting Bracket Assy.
3	01-8-508-T	Solenoid Bracket
4	10-135	Solenoid Spring
5	23-6420	Rubber Grommet
6	AE-23-800	Coil Assembly
7	03-7067-5	Coil Tubing
8	4008-01017-04	Mach. Screw, #8-32 x 1/4"
9	03-8523	Insulator

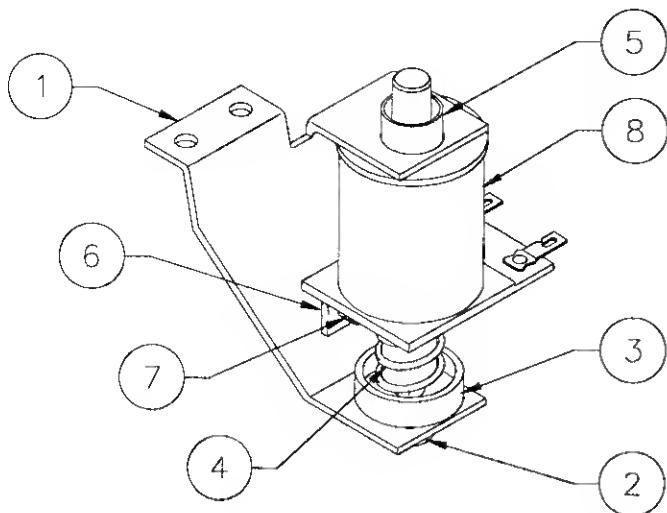
## B-11873

### Bottom Arch Kicker Assembly



<u>Item</u>	<u>Part Number</u>	<u>Description</u>
1	A-6306-2	Bell Armature Assembly
2	AE-23-800	Coil Sub-Assembly
3	01-11273	Mounting Bracket
4	01-8-508-T	Solenoid Bracket
5	03-7067-5	Coil Tubing
6	10-135	Solenoid Spring
7	23-6420	Rubber Grommet
8	4008-01017-04	Mach. Screw, 8-32 x 1/4"
9	03-8523	Insulator

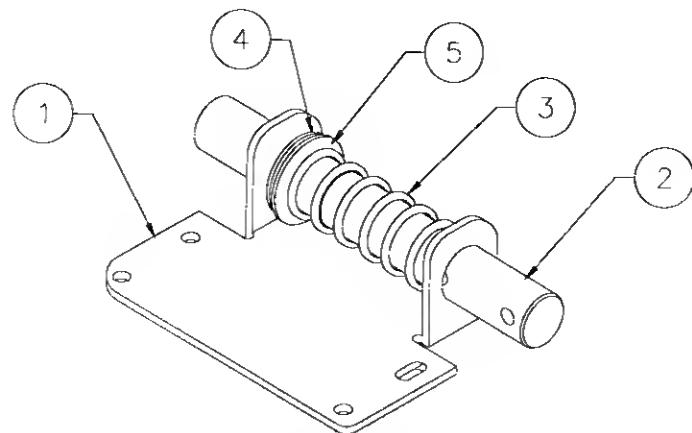
**A-20134**  
**Eject Assembly**



Item	Part Number	Description
1	01-13899	Bracket
2	23-6420	Rubber Grommet
3	A-15371	Plunger Assembly
4	10-135	Spring
5	03-7067-5	Coil Tubing
6	01-8-508-T	Solenoid Bracket
7	4008-01017-04	Mach. Screw, 8-32 x 1/4"
8	AE-27-1200	Coil Assembly

A-20181-1  
A-20181-2

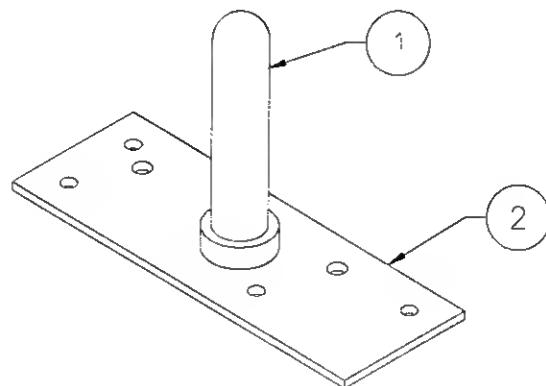
Pivot Assembly - Right  
Pivot Assembly - Left



Shown: A-20181-2 Pivot Assembly - Left

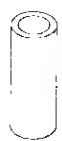
Item	Part Number	Description
1	01-13921	Pivot Bracket
2	02-5178	Pivot Pin
3	10-501	Spring - Compression
4	20-8712-62	"E" Retaining Ring
5	4700-00109-00	Flat Washer, 5/8 x 1 x 20ga.

## 04-10084.1 Pin Plate Weldment



Item	Part Number	Description
1	02-5179	Stay Arm Pin
2	01-13915.1	Stay Arm Plate

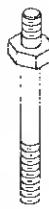
## Posts



**02-4020**  
Support Post



**02-3905**  
Bumper Post #8 WS



**02-4424-2**  
Post #6-32/#8-32



**02-4425-1**  
Post #8-32/#8-32



**02-4659-1**  
Mini-Post



**02-4660**  
Mini-Post Single Bumper



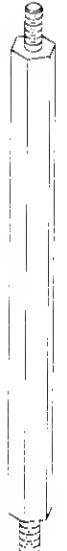
**02-5107**  
Adjusting Post



**02-4842**  
Bumper Post



**02-5201-1**  
Standoff, 8-32x1/4" Hex.



**02-5173-1**  
Post #6-32/8-32 x 4.50"



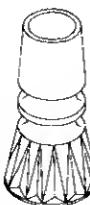
**02-4972-2**  
5/16" Hex. Standoff, 3.50"  
**02-4972-3**  
5/16" Hex. Standoff, 4"  
**02-4972-4**  
5/16" Hex. Standoff, 4.75"



**02-5048-3**  
M-F Spacer, 1.53"  
**02-5048-4**  
M-F Spacer, 1.74"  
**02-5048-5**  
M-F Spacer, 3.05"



**03-8044-13**  
Mini-Post, Clear



**03-8130-13**  
Double Post



**03-8319-13**  
Post #8 Starred

# Unique Parts

## Backbox

A-16917-50025	Sound Board Assembly
A-17651-50025	WPC CPU Board Assembly
A-19985	Speaker/Display Assembly
04-10012-50025	Backbox, Wood

## Insert Panel

H-20161	Insert Cable
11-50025-IN	Wood Insert Panel

## Playfield

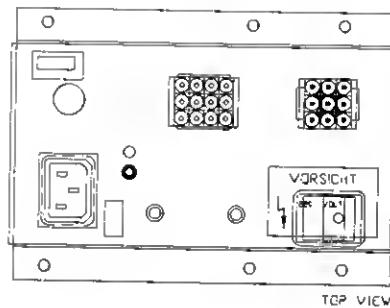
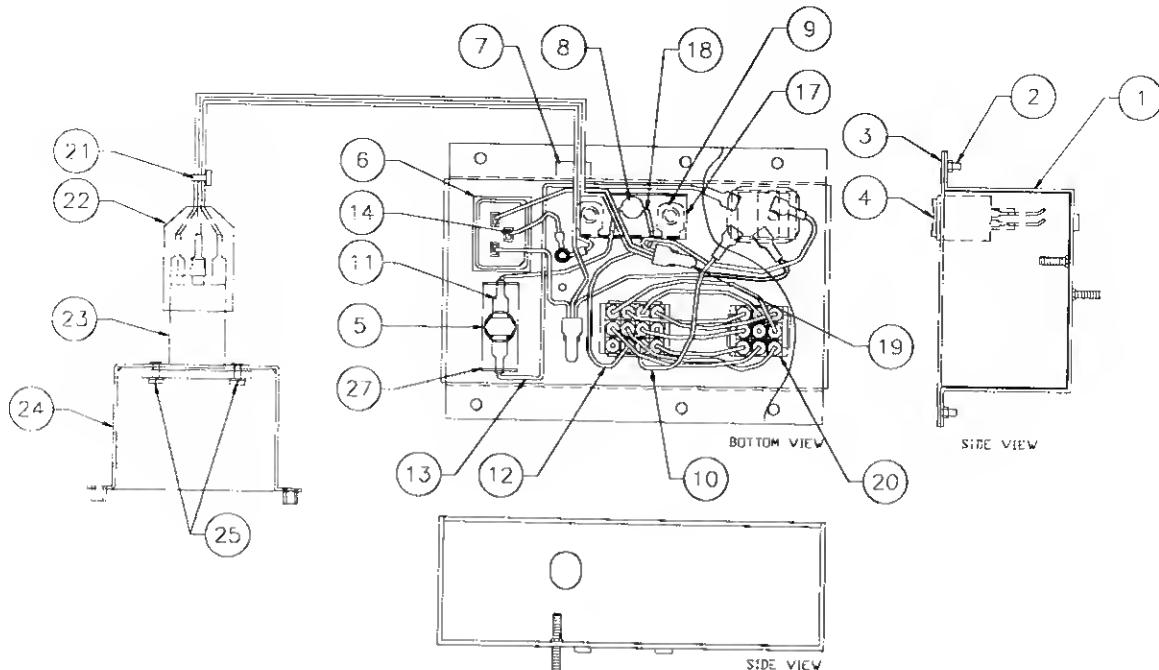
A-19945	Flipper Assembly, Upper Right (Long Shaft)	H-20151.1	Playfield Lamp Cable
A-19948	Underside Trough Assembly	H-20152	Playfield Solenoid Cable
A-19952	2-Position Stationary Target	H-20153	Playfield Opto Cable
A-19962	Ramp Assembly #2	01-13759	Ball Guide #1
A-19965	Ball Popper Assembly	01-13760	Ball Guide #2
A-20031	Ramp Assembly #1	01-13762	Ball Guide #4
A-20033	Back Panel Assembly	01-13763	Ball Guide #5
A-20041-1	12-Lamp PCB & Spacer Assembly	01-13764	Ball Guide #6
A-20042-1	3-Lamp PCB & Spacer Assembly	01-13765.1	Ball Guide #7
A-20043-1	15-Lamp & 1-Lamp PCB & Spacer Assy.	01-13766	Ball Guide #8
A-20044-1	8-Lamp PCB & spacer Assembly	01-13767	Ball Guide #9
A-20074	Spin Target Assembly	01-13769	Ball Guide #12
A-20078	Left Wire Ramp & Switch Assembly	01-13825.1	Ball Deflect Plate
A-20134	Eject Assembly	01-13893.1	Upper Housing Assembly
A-20142	Skull Assembly	01-13902	Ball Guide #15
A-20144	Skull Base Assembly	01-13904.2	Ramp Ball Guide Guard
A-20181-1	Pivot Bracket Assembly, Right	01-13938	Skull Guide Cover
A-20181-2	Pivot Bracket Assembly, Left	02-5173-1	Post M-M 6-32/8-32 x 4.5"
A-20187	Ball Hang Up Bracket Assembly	02-5174	Skull Standoff
A-20202	Drop Target & Decal Assembly	02-5201-1	Post Standoff 8-32 x 2"-1/4" Hex.
A-20203	Catcher Ramp Assembly	04-10027.1	Snorkel Assembly
A-20215	Gate & Bracket Assembly	04-10084.1	Pin Plate Weldment
A-20221 - A-20230	Playfield Plastic Assembly	20-10136-6	Flipper w/Long Shaft, Yellow
A-20233	Lamp/Reflector & Bracket Assembly	31-2325-20	Playfield Plastic
A-20241	Block & Plastic Assembly	31-2325-37	Playfield Plastic
A-20412	Catcher Ramp & Decal Assembly	36-50025	Playfield Hardcoat, Screened
H-20150	Playfield Switch Cable		

## Cabinet

H-20162	Cabinet Switch/Lamp Cable
03-9366.1	Switch Disk
03-9367	Switch Spacer
01-13916.3	Stay Arm, Tube
11-1230	Wood Cabinet
20-9663-B-8	Push Button, Large Round (Red)

# A-17540

## Universal Power Interface Assembly



Item	Part Number	Description	Item	Part Number	Description
1	01-12293.1	Power Control Chassis Box	14	H-17542	Ground Jumper Grn/Yel Cable
2	4406-01128-00	Nut #6-32 KEPS	15	5797-13940-01	Jumper Cable
3	01-12294	Switch Mounting Plate Assembly	16	01-10623	Insulator, Thermistor
4	5642-13935-00	Power Switch	17	01-12299	Insulator, Terminal Strip
5	5733-12869-00	Fuse Holder Panel	18	RM-21-06	#18 Vinyl Fgls
6	5851-13867-00	Outlet-IEC Conn. 237 Socket	19	5822-13865-00	Terminal Strip 3-CKT 2-Mtg.
7	03-8712	Strain Relief Bushing	20	H-18050	Jumper Cable, Transformer Prog.
8	5016-12978-00	Thermistor 8A., 2.5R25	21	03-7933	Ty-Wrap Nylon
9	4006-01003-10	Mach. Screw, #6-32 x 5/8"	22	20-9682-1	Boot w/9-32 Dia. Hole
10	H-17992	Jumper Cable Neutral Sw/1FC	23	5102-13864-00	Line Filter w/IEC Connector
11	H-17543	Hot Jumper Black Cable	24	01-12292	Line Filter Chassis Box
12	H-17546	Jumper Interface Hot Black Cable	25	4004-01003-05	Mach. Screw, #4-40 x 5/16"
13	H-17545	Jumper Switch/Fuse Black Cable			

# Universal Power Interface/Cordset Application Chart

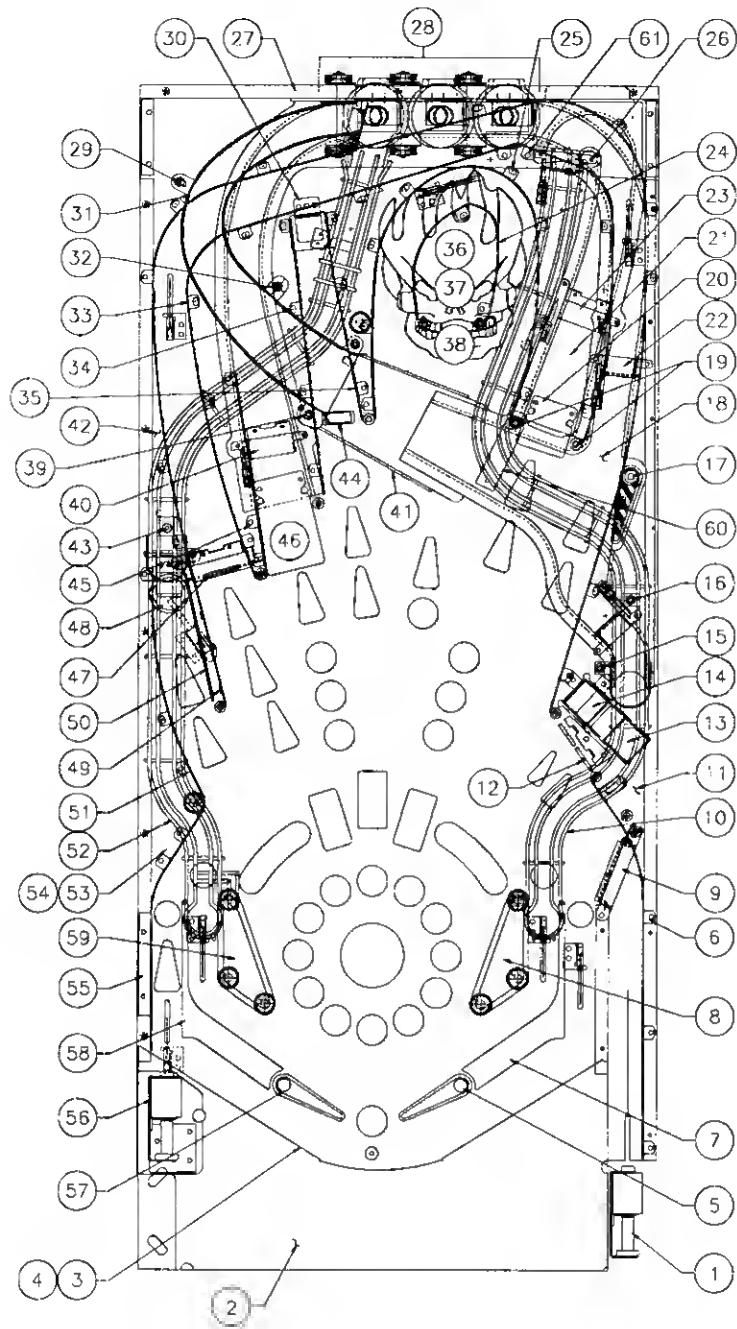
COUNTRY	UNIVERSAL PWR. INTERFACE ASSEMBLY	VOLTAGE PROGRAMMING JUMP CABLE	5AMP FUSE/ LABEL	8AMP FUSE/ LABEL	LABEL HIGH/ VOLTAGE CAUTION	POWER ADAPTER CORD	CORDSET												
							H-17837-1	H-17837-2	H-17837-3	H-17837-4	5731-09651-00 FUSE 16-9668 LABEL	5730-09252-00 FUSE 16-9670 LABEL	16-9669	5850-14052-00	5850-13271-00	5850-13272-00	5850-13273-00	5850-13274-00	5850-13275-00
UNITED STATES	X	X			X X								X	X					
CANADA	X	X			X X								X						
TAIWAN	X	X			X X								X						
MEXICO	X	X			X X								X						
CENTRAL AMERICA	X	X			X X								X						
SOUTH KOREA	X	X			X X								X						
PUERTO RICO	X	X			X X								X						
AUSTRIA	X		X X X			X							X						
BELGIUM	X		X X X			X							X						
FINLAND	X		X X X			X							X						
FRANCE	X		X X X			X							X						
GREECE	X		X X X			X							X						
HOLLAND	X		X X X			X							X						
HUNGARY	X		X X X			X							X						
NETHERLANDS	X		X X X			X							X						
NETH. ANTILLES	X		X X X			X							X						
NORWAY	X		X X X			X							X						
PELAND	X		X X X			X							X						
PORTUGAL	X		X X X			X							X						
SPAIN	X		X X X			X							X						
SWEDEN	X		X X X			X							X						
TURKEY	X		X X X			X							X						
WEST GERMANY	X		X X X			X							X						
UNITED KINGDOM	X		X X X			X							X						
IRELAND	X		X X X			X							X						
HONG KONG	X		X X X			X							X						
DENMARK	X		X X X			X							X						
ITALY	X		X X X			X							X						
CHILE	X		X X X			X							X						
PEOPLE'S REP. OF CHINA	X		X X X			X							X						
SWITZERLAND	X		X X X			X							X						
AUSTRALIA	X		X X X			X							X						
NEW ZEALAND	X		X X X			X							X						
ARGENTINA	X		X X X			X							X						
JAPAN	X		X		X X												X X		

## Upper Playfield Parts

<b>Item No.</b>	<b>Part Number</b>	<b>Description</b>	<b>Item No.</b>	<b>Part Number</b>	<b>Description</b>
1	A-14525	Autoplunger	48	A-20134	Eject Assembly
2	A-13204-50025	Bottom Arch Assembly	49	01-13902	Ball Guide #15
3	12-6842	Bottom Arch Fence	50	12-6466-20	Wireform
4	01-13273.1	Bottom Arch Ball Guide	51	01-13760	Ball Guide #2
5	A-14876-R-3 20-9250-6	Flipper Assembly Shaft & Paddle	52	A-20078	Left Wire Ramp Post
6	01-13769	Ball Guide #12	53	02-5048-1	Reflector & Bracket
7	A-20224	Right Flipper Ball Guide	54	A-20233	Reflector
8	A-17811 A-17801	Slingshot Assembly Switch Assembly	55	01-13759	Ball Guide #1
9	A-20215	Ball Gate	56	B-11873	Kickback
10	12-7258	Right Wire Ramp	57	A-15849-L-2 20-9250-6	Flipper Assembly Shaft & Paddle
11	A-20241	Block & Plastic Assembly	58	A-20225	Left Flipper Ball Guide
12	A-19952	2-position Switch Assembly	59	A-17811 A-17801	Slingshot Assembly Switch Assembly
13	A-19965	Ball Popper	60	01-13862.1	Ramp Strap
14	04-10027.1	Snorkel Assembly	61	01-13665.1	Ball Guide #7
15	02-5048-5	Post			
16	02-5048-3	Post			
17	A-19945 20-10136.1-6 4700-00072-00	Flipper Assembly Shaft & Paddle (long) Flat Washer			
18	A-20031 A-20213	Ramp Assembly #1 Switch Sign			
19	02-5173-1	Post			
20	01-13778	Ramp Flap			
21	A-19962	Ramp Assembly #2			
22	A-20069-1 12-6909-2	Gate & Switch Assembly Wireform			
23	A-20068 12-7279	Switch Gate & Bracket Wireform			
24	01-13766	Ball Guide #8			
25	01-13767	Ball Guide #9			
26	A-20069 12-6909-2	Switch Gate & Bracket Wireform			
27	A-20033	Back Panel Assembly			
28	A-20034	Opto Mounting Bracket			
29	02-4972-4	Post			
30	01-12613	Ball Deflector			
31	04-10076	Ramp Catcher			
32	02-4972-3	Post			
33	01-13762	Ball Guide #4			
34	01-13763	Ball Guide #5			
35	01-13764	Ball Guide #6			
36	A-20142	Skull Assembly			
37	A-20144	Skull Base Assembly			
38	01-13893	Upper Housing			
39	02-4972-2	Post			
40	A-20109 12-7279	Switch Gate & Bracket Wireform			
41	A-20203	Catcher Ramp Assembly			
42	A-20187	Ball Hangup & Plastic Assy			
43	02-5048-3	Post			
44	A-20202	Drop Target			
45	01-13904.2	Ramp Guard Ball Guide			
46	01-13855	Ramp Flap			
47	A-20074 A-20212	Spin Target Spinner Sign			

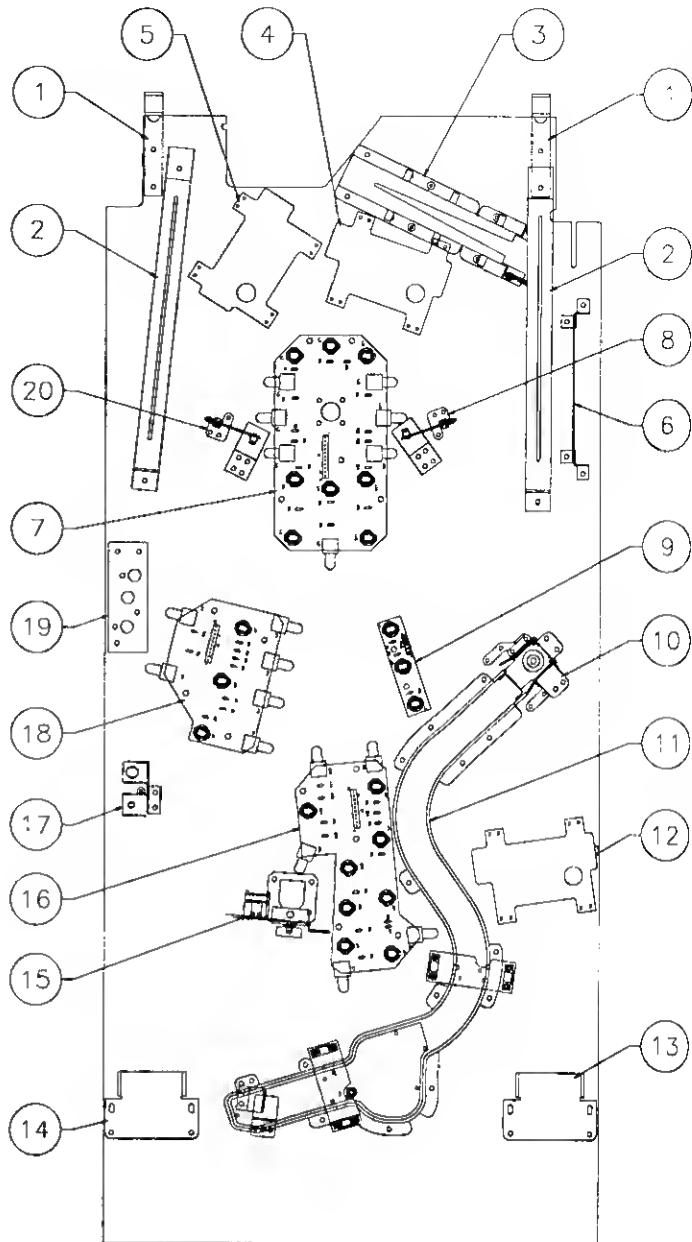
*\*The NO FEAR hardcoat playfield does not require a full mylar. However, mylars can be purchased through your local Williams distributor.*

## Upper Playfield Parts



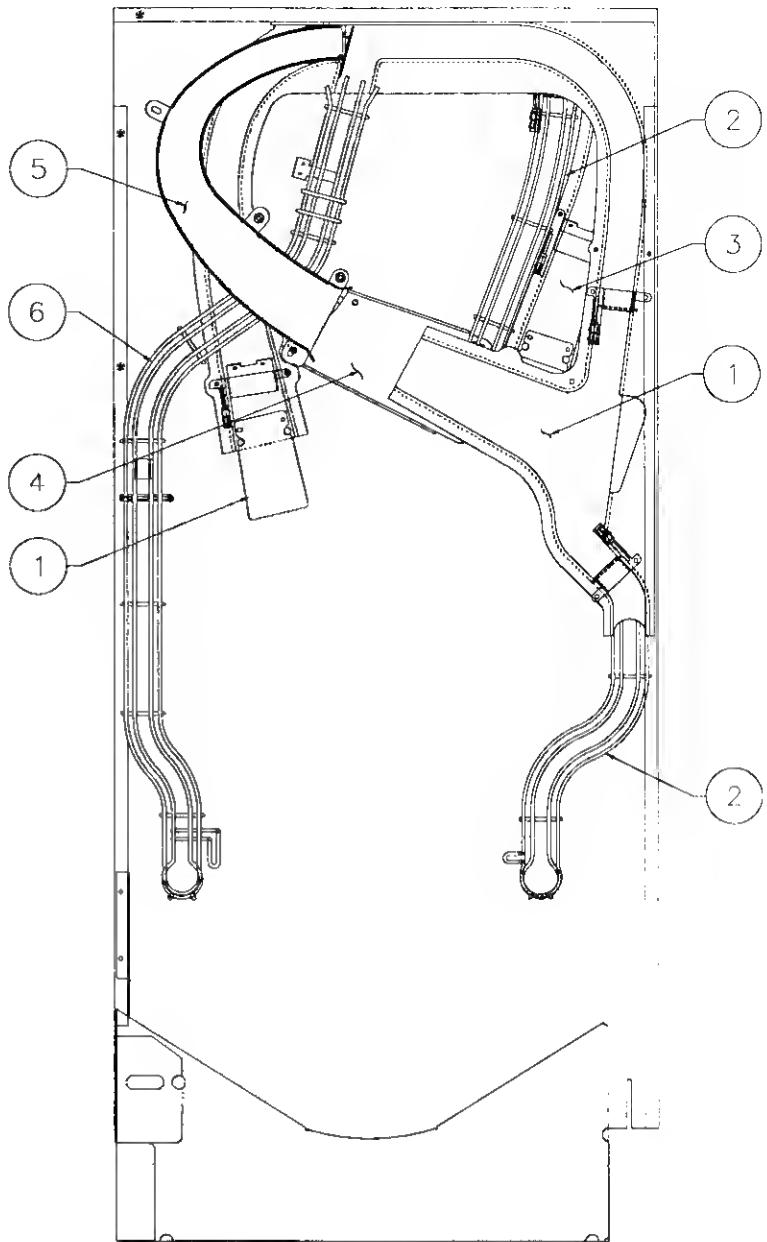
## Lower Playfield Parts

Item	Part Number	Description
1	01-9211	Pfld. Hanger Brack,et Assy. (2)
2	01-11781	Leg Support (2)
3	A-19963	Outhole Ball Trough Assy.
4	A-14876-R-3	Flipper Assembly, Lwr. Right
5	A-15849-L-2	Flipper Assembly, Lwr. Left
6	A-17223	16-Opto PCB & Bracket Assy.
7	A-20043	16-Lamp Board Assembly
8	A-17811	Kicker Arm (Slingshot) Assy.
	B-9362-R-3	Coil & Bracket Assy., Right
9	A-20042	3-Lamp Board Assembly
10	A-19965	Ball Popper Assembly
11	A-19948	Underside Ball Trough Assy.
12	A-19945	Flipper Assembly, Upper Right
13	A-20181-1	Pivot Assembly, Right
14	A-20181-2	Pivot Assembly, Left
15	A-14615	1-Bank Drop Target Assembly
16	A-20041	12-Lamp PCB Assembly
17	A-20134	Eject Assembly
18	A-20044	8-Lamp Board Assembly
19	04-10084.1	Pin Plate Weldment
20	A-17811	Kicker Arm (Slingshot) Assy.
	B-9362-L-2	Coil & Bracket Assy., Left



## Ramps

Item	Part Number	Description
1	A-20031	<b>Ramp #1 Assembly</b> Gate & Switch Assembly Switch Gate & Bracket Assy. RTV Opto Photo Transistor RTV Opto LED Assembly Ramp Cable Cover Assembly 31-2333-1 Decal 31-2333-3 Decal 31-2333-4 Decal 31-2334-4 Decal - Top 03-8044-13 Mini Post, Clear
2	12-7258.1	<b>Wire Ramp, Right</b>
3	A-19962	<b>Ramp #2 Assembly</b> 31-2333-2 Decal - Ramp A-20069 Switch Gate & Brkt. Assy. A-20068 Switch Gate & Brkt Assy.
4	A-20203	<b>Catcher Ramp Assembly</b>
5	A-20412	<b>Catcher Ramp w/Decals</b> 31-2334-1 Decal 31-2334-2 Decal
6	A-20078 5647-12693-13	<b>Wire Ramp, Left</b> Mini Micro Switch



# Lamp Matrix Table

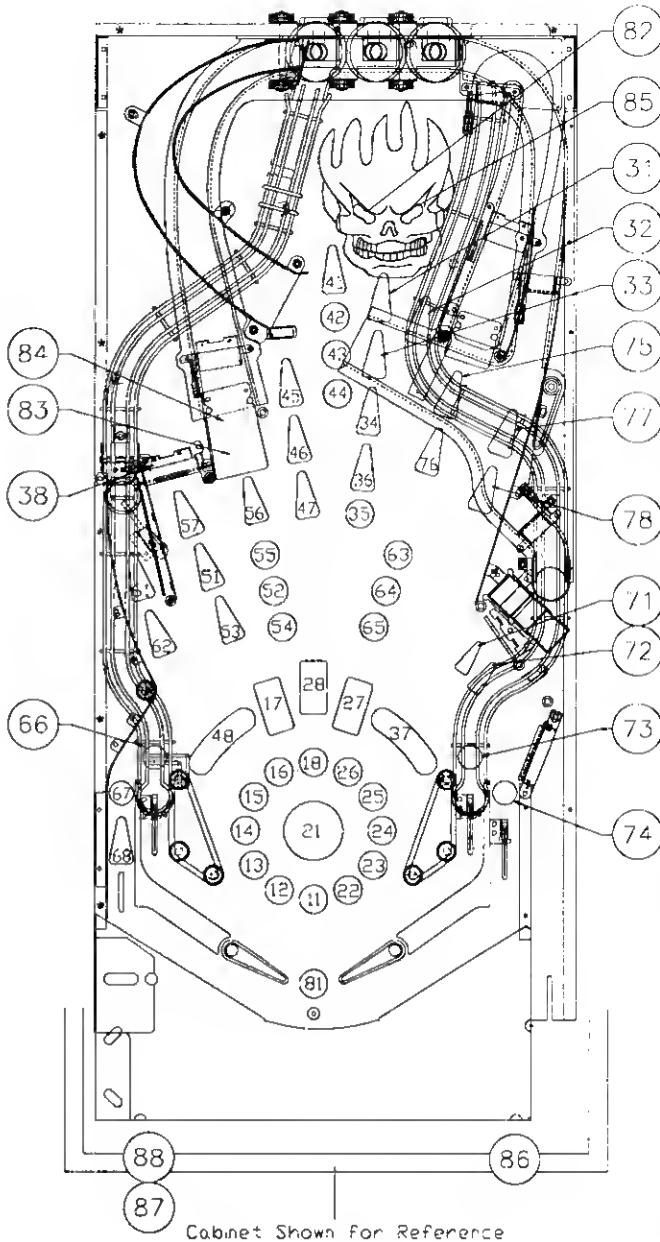
YELLOW (B+)  RED

COLUMN ROW	1 Yellow-Brown J137-1 Q98	2 Yellow-Red J137-2 Q97	3 Yellow-Orange J137-3 Q96	4 Yellow-Black J137-4 Q95	5 Yellow-Green J137-5 Q94	6 Yellow-Blue J137-6 Q93	7 Yellow-Violet J137-7 Q92	8 Yellow-Grey J137-9 Q91
Red-Brown J134-1 Q90 1	RACEWAY AWARD 3 11	NO FEAR 21	SKULL 31	LEFT TRACK 41	RACEWAY 51	TUBE 61	LIGHT KICKBACK TOP 71	SHOOT AGAIN 81
Red-Black J134-2 Q89 2	RACEWAY AWARD 2 12	RACEWAY AWARD 4 22	RIGHT TRACK 32	FIRST PLACE 42	LEFT RAMP TURN 52	VIDEO MODE 62	LIGHT KICKBACK BOTTOM 72	LEFT SKULL EYE 82
Red-Orange J134-4 Q88 3	RACEWAY AWARD 1 13	RACEWAY AWARD 5 23	CENTER JACKPOT 33	SECOND PLACE 43	SUPER SPINNER 53	R'CHT RAMP WIN 63	RIGHT FLIPPER LANE 73	JUMP NOW 83
Red-Yellow J134-5 Q87 4	LEFT OVER THE EDGE 14	RIGHT OVER THE EDGE 24	EXTRA BALL 34	THIRD PLACE 44	LEFT RAMP START 54	R'CHT RAMP TURN 64	RIGHT OUTLANE 74	SUPER JACKPOT 84
Red-Green J134-6 Q87 5	DIRT 15	AIR 25	START CHALLENGE 35	SKYDIVE 45	LEFT RAMP WIN 55	RIGHT RAMP START 65	HAIRPIN 75	RIGHT SKULL EYE 85
Red-Blue J134-7 Q86 6	ASPHALT 16	SNOW 26	CENTER LOCK 36	DROP JACKPOT 46	HILL CLIMB 56	LEFT FLIPPER LANE 66	DOWNHILL 76	BALL LAUNCH 86
Red-Violet J134-8 Q84 7	NO LIMITS 17	FEAR FEST 27	RIGHT AUTOFIRE (2) 37	DROP LOCK 47	SCREAMER 57	LEFT OUTLANE 67	SUMMIT 77	BUY IN BUTTON 87
Red-Gray J134-9 Q83 8	WATER 18	MEET YOUR MAKER 28	LEFT HURRY UP 38	LEFT AUTOFIRE (2) 48	NOT USED 58	KICKBACK 68	RIGHT HURRY UP 78	START BUTTON 88

J1XX = POWER DRIVER BOARD

## Lamp Locations

Item No.	Bulb Number	Lamp Assy Number	Description
11	24-8768	A-20043	Raceway Awd. 3
12	24-8768	A-20043	Raceway Awd. 2
13	24-8768	A-20043	Raceway Awd. 1
14	24-8768	A-20043	Lt. Over the Edge
15	24-8768	A-20043	Dirt
16	24-8768	A-20043	Asphalt
17	24-8768	A-20043	No Limits
18	24-8768	A-20043	Water
21	24-8768	A-20043	No Fear
22	24-8768	A-20043	Raceway Awd. 4
23	24-8768	A-20043	Raceway Awd. 5
24	24-8768	A-20043	Rt. Over the Edge
25	24-8768	A-20043	Air
26	24-8768	A-20043	Snow
27	24-8768	A-20043	Fear Fest
28	24-8768	A-20043	Meet Your Maker
31	24-8768	A-20041	Skull
32	24-8768	A-20041	Right Track
33	24-8768	A-20041	Center Jackpot
34	24-8768	A-20041	Extra Ball
35	24-8768	A-20041	Start Challenge
36	24-8768	A-20041	Center Lock
37	24-6549	A-17835	Right Autofire (2)
38	24-8768	B-12224	Left Hurry Up
41	24-8768	A-20041	Left Track
42	24-8768	A-20041	First Place
43	24-8768	A-20041	Second Place
44	24-8768	A-20041	Third Place
45	24-6549	A-17807	Skydive
46	24-8768	A-20041	Drop Jackpot
47	24-8768	A-20041	Drop Lock
48	24-6549	A-17835	Left Autofire (2)
51	24-8768	A-20044	Raceway
52	24-8768	A-20044	Left Ramp Turn
53	24-8768	A-20044	Super Spinner
54	24-8768	A-20044	Left Ramp Start
55	24-8768	A-20044	Left Ramp Win
56	24-8768	A-20044	Hill Climb
57	24-8768	A-20044	Screamer
58			NOT USED
61	24-6549	A-17807	Tube
62	24-8768	A-20044	Video Mode
63	24-8768	A-20042	Right Ramp Win
64	24-8768	A-20042	Right Ramp Turn
65	24-8768	A-20042	Right Ramp Start
66	24-6549	A-17835	Left Flipper Lane
67	24-6549	A-17807	Left Outlane
68	24-6549	A-17835	Kickback
71	24-6549	A-17835	Light Kickbck Top
72	24-6549	A-17835	Light Kickbck Btm
73	24-6549	A-17835	Right Flipper Lane
74	24-6549	A-17835	Right Outlane
75	24-6549	A-17807	Hairpin
76	24-6549	A-17835	Downhill
77	24-6549	A-17807	Summit
78	24-6549	A-17835	Right Hurry Up



Item No.	Bulb Number	Lamp Assy Number	Description
81	24-6549	A-17807	Shoot Again
82	24-6549	04-10083	Left Skull Eye
83	24-8768	B-12224	Jump Now
84	24-8768	B-12224	Super Jackpot
85	24-6549	04-10083	Right Skull Eye
86	-----	20-9663-B-8	Ball Launch
87	-----	20-9663-18	Buy-in Button
88	-----	20-9663-1	Start Button

24-6549 = #44 BULB

24-8768 = #555 BULB

# Switch Matrix Table



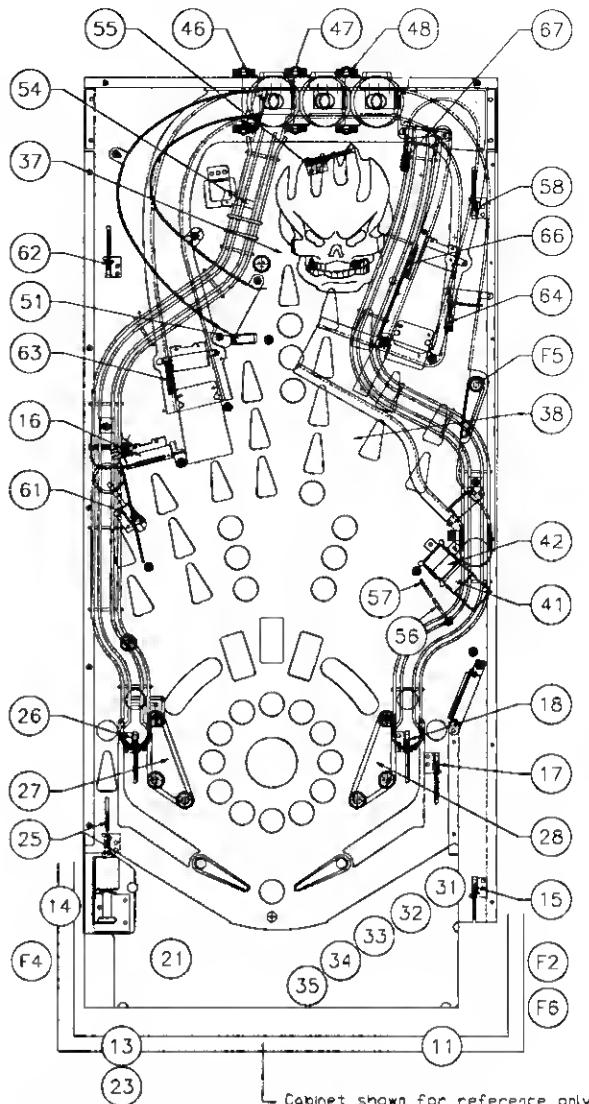
Dedicated Grounded Switches	COLUMN \ ROW	1 Green-Brown J207-1 U20-18	2 Green-Red J207-2 U20-17	3 Green-Orange J207-3 U20-16	4 Green-Yellow J207-4 U20-15	5 Green-Black J207-5 U20-14	6 Green-Blue J207-6 U20-13	7 Green-Violet J207-7 U20-12	8 Green-Gray J207-9 U20-11	Flipper Grounded Switches
Org-Brn J205-1 Left Coin Chute D1	White-Brown J209-1 U18-11 1	BALL LAUNCH 11	SLAM TILT 21	TROUGH STACK 31	RIGHT POPPER 1 41	DROP TARGET 51	EJECT HOLE 61	NOT USED 71	NOT USED 81	Block-Green J905-1 Lower Right E.O.S. F1
Org-Red J205-2 Center Coin Chute D2	White-Red J209-2 U18-9 2	NOT USED 12	COIN DOOR CLOSED (RIGHT)	TROUGH 1 32	RIGHT POPPER 2 42	NOT USED 52	LEFT LOOP 62	NOT USED 72	NOT USED 82	Blue-Violet J905-1 Lower Right Opto F2
Org-Blk J205-3 Right Coin Chute D3	White-Orange J209-3 U18-5 3	START BUTTON 13	BUY EXTRA BALL 23	TROUGH 2 33	NOT USED 43	NOT USED 53	LEFT RAMP ENTER 63	NOT USED 73	NOT USED 83	Block-Blue J905-3 Lower Left E.O.S. F3
Org-Yel J205-4 4th Coin Chute D4	White-Yellow J209-4 U18-7 4	PLUMB BOB TILT 14	ALWAYS CLOSED 24	TROUGH 3 34	NOT USED 44	LEFT WIREFORM 54	LEFT RAMP MIDDLE 64	NOT USED 74	NOT USED 84	Blue-Gray J905-2 Lower Left Opto F4
Org-Grn J205-6 Normal Test Service Escape Credit D5	White-Green J209-5 U19-11 5	SHOOTER LANE 15	KICKBACK 25	TROUGH 4 35	NOT USED 45	INNER LOOP 55	NOT USED 65	NOT USED 75	NOT USED 85	Black-Violet J905-4 Upper Right E.O.S. F5
Org-Blu J205-7 Normal Test Volume Down Down D6	White-Blue J209-7 U19-9 6	SPINNER 16	LEFT RETURN 26	NOT USED 36	LEFT MAGNET 46	LIGHT KICKBACK BOTTOM 56	RIGHT RAMP ENTER 66	NOT USED 76	NOT USED 86	Black-Yellow J905-3 Upper Right Opto F6
Org-Vio J205-8 Normal Test Volume Up Up D7	White-Violet J209-8 U19-5 7	RIGHT OUTLANE 17	LEFT SUNSHOT 27	CENTER TROUGH ENTER 37	CENTER MAGNET 47	LIGHT KICKBACK TOP 57	RIGHT RAMP EXIT 67	NOT USED 77	NOT USED 87	Black-Gray J905-5 Upper Left E.O.S. F7
Org-Gry J205-9 Normal Test Begin Enter Test D8	White-Gray J209-9 U19-7 8	RIGHT RETRUN 18	RIGHT SUNSHOT 28	LEFT TROUGH ENTER 38	RIGHT MAGNET 48	RIGHT LOOP 58	NOT USED 68	NOT USED 78	NOT USED 88	Black-Blue J905-5 Upper Left Opto F8

J2XX = CPU BOARD; J9XX = FLIPTRONIC II BOARD

= OPTO, TYPICALLY CLOSED

# Switch Locations

Item No.	Switch Part Number	Description
F1	SW-1A-194	Lwr Right Flipper E.O.S.
F2	A-17316	Lwr Right Flipper Cab.
F3	SW-1A-194	Lwr Left Flipper E.O.S.
F4	A-17316	Lwr Left Flipper Cab.
F5	SW-1A-194	Upr Right Flipper E.O.S.
F6	A-17316	Upr Right Flipper Cab.
F7		NOT USED
F8		NOT USED
11	20-9663-B-8	Ball Launch
12		NOT USED
13	20-9663-1	Start Button
14	A-15361	Plumb Bob Tilt*
15	A-18973	Shooter Lane
16	5647-12693-24	Spinner
17	5647-12693-19	Right Outlane
18	5647-12693-19	Right Return
21	A-17238	Slam Tilt*
22	5643-09268-00	Coin Door Closed*
23	20-9663-18	Buy Extra Ball
24	5643-09112-00	Always Closed*
25	5647-12693-19	Kickback
26	5647-12693-19	Left Return
27	A-17800 (Kick)	Left Slingshot
	A-17794 (Score)	
28	A-17800 (Kick)	Right Slingshot
	A-17794 (Score)	
31	A-18617-1 (LED)	Trough Stack
	A-18618-1 (Trans.)	
32	A-18617-1 (LED)	Trough 1 (Right)
	A-18618-1 (Trans.)	
33	A-18617-1 (LED)	Trough 2
	A-18618-1 (Trans.)	
34	A-18617-1 (LED)	Trough 3
	A-18618-1 (Trans.)	
35	A-18617-1 (LED)	Trough 4
	A-18618-1 (Trans.)	
36		NOT USED
37	A-16908 (LED)	Center Trough Enter
	A-16909 (Trans.)	
38	A-16908 (LED)	Left Trough Enter
	A-16909 (Trans.)	
41	A-16908 (LED)	Right Popper 1
	A-16909 (Trans.)	
42	A-16908 (LED)	Right Popper 2
	A-16909 (Trans.)	
43		NOT USED
44		NOT USED
45		NOT USED
46	A-16908 (LED)	Left Magnet
	A-16909 (Trans.)	
47	A-16908 (LED)	Center Magnet
	A-16909 (Trans.)	
48	A-16908 (LED)	Right Magnet
	A-16909 (Trans.)	
51	5647-12693-31	Drop Target
52		NOT USED



Cabinet shown for reference only

Item No.	Switch Part Number	Description
		NOT USED
53	5647-12693-13	Left Wireform
54	5647-12693-19	Inner Loop
55	SW-1A-170-15	Light Kickback Bottom
56	SW-1A-170-15	Light Kickback Top
57	5647-12693-19	Right Loop
58	5647-12693-24	Left Ramp Enter
61	5647-12133-11	Eject Hole
62	5647-12693-19	Left Loop
63	5647-12693-24	Left Ramp Middle
64	5647-12693-11	NOT USED
65	5647-12693-24	Right Ramp Enter
66	5647-12693-11	Right Ramp Exit
67	5647-12693-31	68 through 88 are NOT USED
		* Not Shown

# Solenoid/Flashlamp Table

SOI. NO.	FUNCTION	SOLENOID TYPE	VOLTAGE CONNECTIONS			DRIVE XISTOR	DRIVE CONNECTIONS			DRIVE WIRE	SOLENOID PART NUMBER FLASHLAMP TYPE	
			PLAYFIELD	BACKBOX	CABINET		PLAYFIELD	BACKBOX	CABINET		PLAYFLD	BACKBOX
#1	RIGHT POPPER	High Power	J107-2			Q82	J130-1			VC-BRN	AC-23-80C	
02	AUTO PLUNGER	High Power	J107-2			Q80	J130-2			VC-RED	AE-23-80C	
03	RIGHT MAGNET	High Power	J107-2			Q78	J130-4			VG-ORG	2G-10197-2*	
04	KICKBACK	High Power	J107-2			Q76	J130-5			VG-YEL	AE-23-80D	
05	CENTER MAGNET	High Power	J107-2			Q64	J130-6			VO-CRN	20-10197-1*	
06	LEFT MAGNET	High Power	J107-2			Q66	J130-7			VO-BLU	20-10197*	
07	KNOCKER	High Power		J107-2		Q68		J130-8		VO-B.K		AE-23-800
08	DROP TARGET DOWN	High Power	J107-2			Q70	J130-9			VO-GRY	SM1-26-600	
09	NOT USED	Low Power				Q58				BRN-BLK		
10	RIGHT SLINGSHOT	Low Power	J107-3			Q56	J127-3			BRN-RED	AE-26-1200	
11	LEFT SLINGSHOT	Low Power	J107-3			Q54	J127-4			BRN-ORG	AE-26-1200	
12	DROP TARGET UP	Low Power	J107-3			Q52	J127-5			BRN-YEL	AE-26-1200	
13	NOT USED	Low Power				Q50				BRN-CRN		
14	TOUCH	Low Power	J107-3			Q48	J127-7			BRN-BLU	AE-26-1500	
15	EJECT	Low Power	J107-3			Q46	J127-8			BRN-VIC	AE-27-1200	
16	SKIN MOUTH	Low Power	J107-3			Q44	J127-9			BRN-GRY	SM-30-100	
17	TOP RETURN FL	Flashlamp	J107-6			Q42	J125-1			BLK-BRN	#89 (2)	
18	SPINN FL	Flashlamp	J107-6			Q40	J126-2			BLK-RED	#905 (1)	
19	NO FEAR FL	Flashamp	J107-6			Q38	J125-3			BLK-ORG	#906 (1)	
20	RIGHT RAMP FL (3)	Flashlamp	J107-6	J106-5		Q36	J125-4	J125-5		BLK-YEL	#89 (1)	#906 (2)
21	SKULL FL (3)	Flashamp	J107-6	J106-5		Q28	J126-5	J125-6		BLU-CRN	#906 (2)	#906 (1)
22	INSERT EXPLODE FL	Flashlamp		J106-5		Q30		J125-7		BLU-BLK		#905 (2)
23	LEFT RAMP FL (3)	Flashlamp	J107-6	J106-5		Q34	J126-7	J125-8		BLU-VIC	#89 (1)	#906 (2)
24	UP LEFT FL	Flashlamp	J107-6			Q32	J126-8			BLU-GRY	#906 (1)	
25	AUTO INTR FL (2)	Gen Purpose	J107-6			Q26	J122-1			BLU-BRN	#89 (2)	
26	TOP LEFT INSERT FL	Gen Purpose		J106-5		Q24		J124-2		BLU-RED		#905 (1)
27	TOP R INSERT FL	Gen Purpose		J106-5		Q22		J124-3		BLU-ORG		#906 (1)
28	RIGHT POPPER FL	Gen Purpose	J107-6			Q20	J122-4			BLU-YEL	#89 (1)	
29-35	SEE FLIPPER GKS											
37	NOT USED	Low Power				Q16				BRN-WHT		
38	NOT USED	Low Power				Q15				BLK-WHT		
39	NOT USED	Low Power				Q14				CRG-WHT		
40	NOT USED	Low Power				Q13				YEL-WHT		
41	NOT USED	Low Power				Q9				CHN-WHT		
42	NOT USED	Low Power				Q10				BLU-WHT		
43	NOT USED	Low Power				Q11				VIO-WHT		
44	NOT USED	Low Power				Q12				GRY-WHT		

## GENERAL ILLUMINATION

01	PLAYFIELD TOP	G.I.		J121-1		Q18		J121-7		WHT-BRN		#555
02	PLAYFIELD RCHT	G.I.	J120-2	J121-2		Q10	J120-8	J121-8		WHT-ORG	#44	#555
03	PLAYFIELD LEFT	G.I.		J121-3		Q14		J121-9		WHT-YEL		#555
04	INSERT TOP	G.I.	J120-5			Q16	J120-10			WHT-CRN	#44	
05	INSERT BACKGROUND	G.I.	J120-6		J119-3	Q12	J120-11	J119-1	WHT-VIO	#44		

FLIPPER CIRCUITS	VOLTAGE CONNECTION		POWER	XISTOR	DRIVE CONNECTION	POWER	COIL	PART NUMBER	COIL COLOR
	POWER	CONNECTION							
29	Power	J907-1 (RED-GRN)	Q4		J902-13		YEL-GRN		
30	LOWER RGT. FLIPPER	Hold	J907-1 (RED-GRN)	Q11	J902-1		ORG-GRN	FL-11629	BLUE
31	Power	J907-1 (RED-BLU)	Q3		J902-9		YEL-BLU		
32	LOWER FLIPPER	Hold	J907-1 (RED-BLU)		J902-7		ORG-BLU	FL-11629	BLUE
33	UPPER RGT. FLIPPER	Power	J907-6 (RED-VIC)	Q2	J902-6		YEL-VIO	FL-11629	BLUF
34	UPPER FLIPPER	Hold	J907-6 (RED-VIO)	Q7	J902-4		ORG-VIO		
35	NOT USED	Power	J907-8 (RED-GRY)	Q1	J902-3		YEL-GRY	NOT USED	NOT USED
36	UP FLIPPER	Hold	J907-8 (RED-GRY)	Q5	J902-1		ORG-GRY		

J1XX X-POWER DRIVER BOARD; JX-X=AUX. DRIVER BOARD; J9XX-X=F\_IPTRONIC I BOARD

24-6549-#44 BULB; 24-8/04-#89 BULB; 24-8768-#555 BULB; 24-8802-#906; 24-8825-#545

\*EACH MAGNET USES A WAVE SPRING WASHER; PART NUMBER 20-9612.

# Solenoid/Flashlamp Locations

Item No.	Coil/ Flasher No.	Assembly Number	Description
01	AE-23-800	A-19965	Right Popper
02	AE-23-800	A-14525	Auto Plunger
03	20-10197-2	A-20034	Right Magnet*
04	AE-23-800	B-11873	Kickback
05	20-10197-1	A-20034	Centr Magnet*
06	20-10197	A-20034	Left Magnet*
07	AE-23-800	A-10686-1	Knocker**
08	SM1-26-600	A-20202	Drop Tgt Down NOT USED
09			
10	AE-26-1200	B-9362-R-3	Right Slingshot
11	AE-26-1200	B-9362-L-2	Left Slingshot
12	AE-26-1200	A-20202	Drop Tgt Up NOT USED
13			
14	AE-26-1500	A-19663	Trough
15	AE-27-1200	A-20134	Eject
16	SM-30-1100	A-20144	Skull Mouth
17	24-8704 (2)	A-17983	Flipper Return
18	24-8802 (1)	C-13337	Spinner
19	24-8802 (2)	C-13337	No Fear
20	24-8704 (1)	A-17983	Right Ramp
21	24-8802 (2)	-----	Insert Panel
22	24-8802 (1)	-----	Skull
23	24-8704 (1)	A-17983	Insert Panel
24	24-8802 (2)	-----	Insert Explode
25	24-8802 (1)	C-13337	Left Ramp
26	24-8704 (2)	A-17803	Insert Panel
27	24-8802 (1)	-----	Top Left
28	24-8802 (1)	-----	Autofire
	24-8704 (1)	A-17983	Top Left Insert
			Top Rt Insert
			Right Popper

\*Magnets use wave spring washer #20-9612.

\*\*Not Shown.

## Flippers

Item No.	Coil Number	Assembly Number	Description
29-30	FL-11629	A-14876-R-3	Lower Right
31-32	FL-11629	A-15849-L-2	Lower Left
33-34	FL-11629	A-19945	Upper Right
35-36			NOT USED

## General Illumination

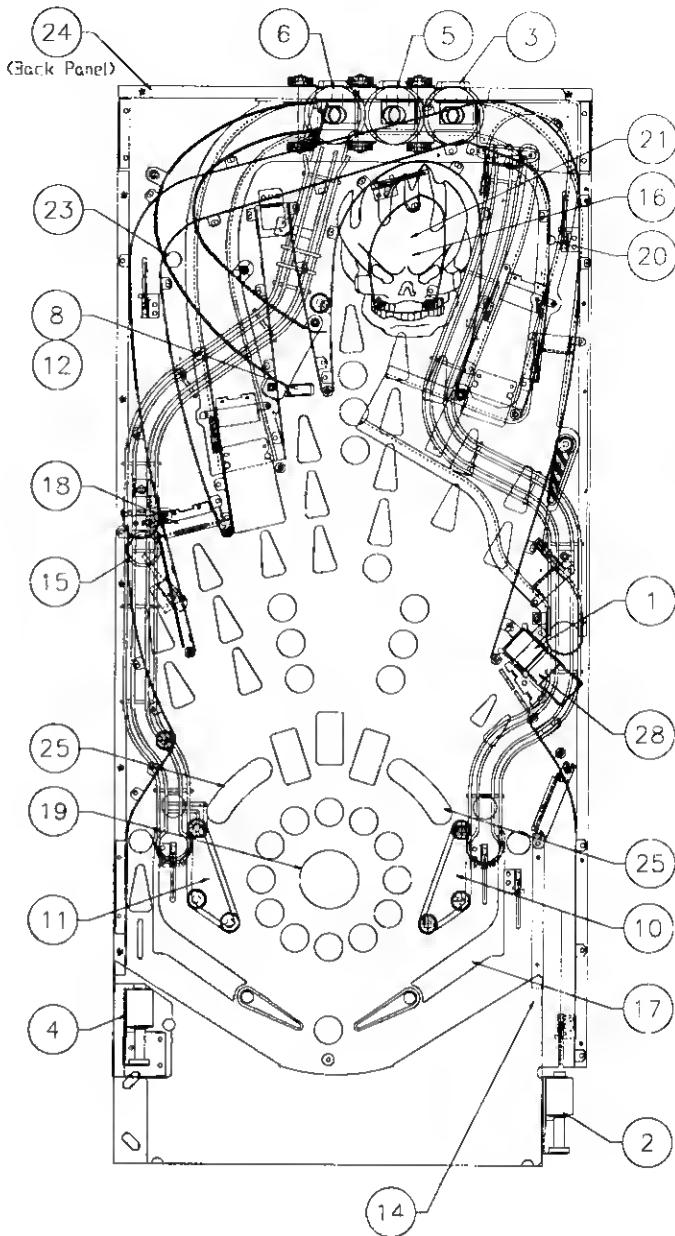
Item No.	Bulb Number	Decsription
01	24-8768	Playfield Top
02	24-6549	Playfield Right
	24-8768	
03	24-8768	Playfield Left
04	24-6549	Insert Title
05	24-6549	Insert Background

24-6549 = #44 BULB

24-8704 = #89 BULB

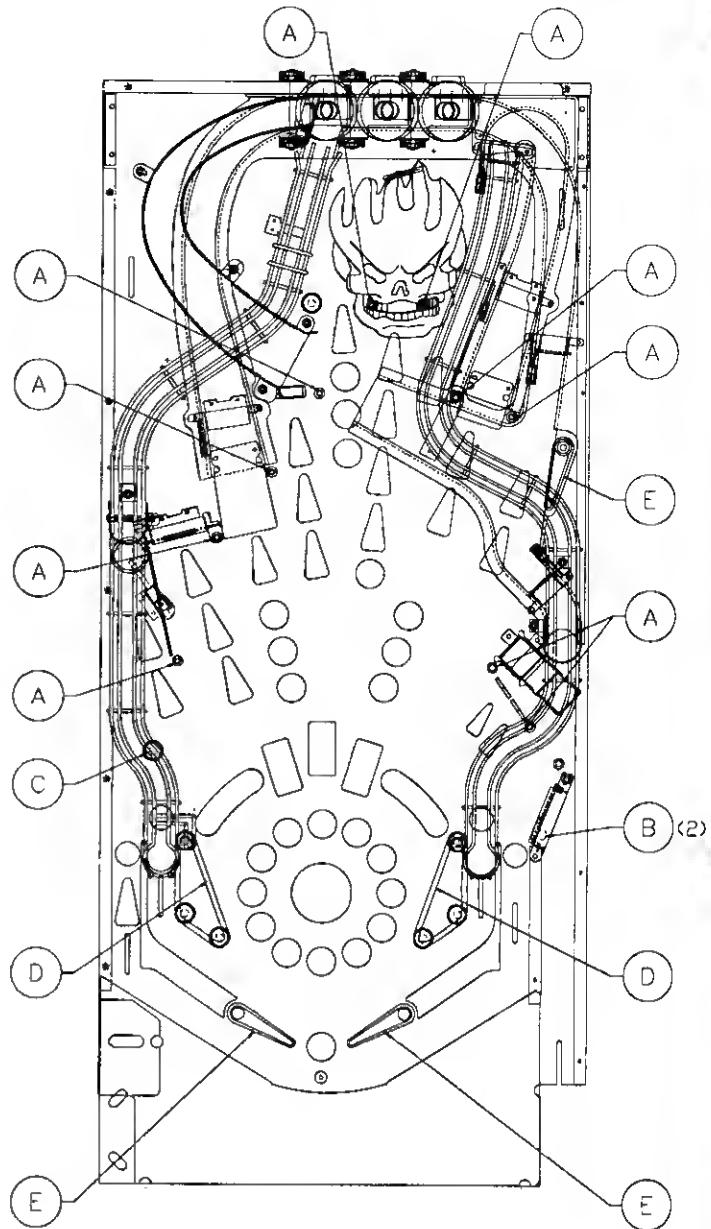
24-8768 = #555 BULB

24-8802 = #906 BULB



## Rubber Parts

Item No.	Part Number	Description	Qty.
A	23-6556	Rubber Bumper Sleeve	10
B	23-6641-1	White Rubber Ring	2
C	23-6694-3	5/16" Black Rubber Ring	1
D	23-6694-10	2-1/2" Black Rubber Ring	2
E	23-6695	Black Flipper Rubber Ring	3



# **SECTION THREE**

## **GAME WIRING AND SCHEMATICS**

### **CONNECTOR & COMPONENT IDENTIFICATION**

Each plug or jack (except the Audio Board and the Dot matrix Display/Driver Board) receives a number that identifies the circuit board and the position on that board that it connects to. J-designations refer to a male connector. P-designations refer to a female connector. For example, J101 designates jack 1 of board 1 (a Power Driver Board jack); P206 designates plug 6 of board 2 (a CPU Board plug). Identifying the specific pin number of a connector involves a hyphen, which separates the pin number from the plug or jack designation. For example, J101-3 refers to pin 3 of jack 1 on board 1.

Other game components may also have similar numbers to clarify their locations or related circuits. For example, F501 refers to a fuse located on the Audio Board.

Prefix numbers for WPC circuit boards are listed below.

- 1 - Power Driver Board
- 2 - CPU Board
- 6 - Dot Matrix Controller Board
- 9 - Fliptronic II Controller Board

The Audio Board and the Dot Matrix Display/Driver Board do not have identification numbers.

**Schematics for standard WPC backbox boards are found in the WPC Schematics Manual. Playfield, cabinet and all other backbox board schematics are found in this section.**

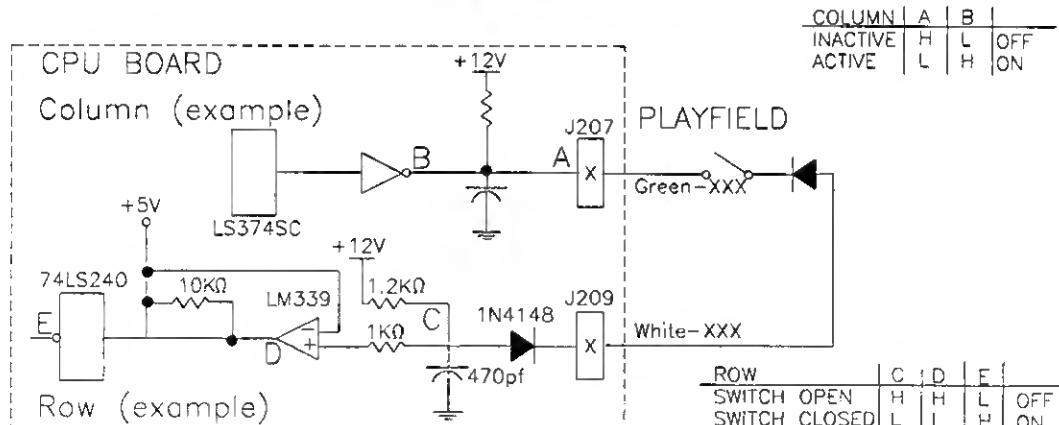
# SWITCH MATRIX

WHITE → O — GREEN

Dedicated Grounded Switches	COLUMN	1 Green— Brown J207-1 U20-18	2 Green— Red J207-2 U20-17	3 Green— Orange J207-3 U20-16	4 Green— Yellow J207-4 U20-15	5 Green— Black J207-5 U20-14	6 Green— Blue J207-6 U20-13	7 Green— Violet J207-7 U20-12	8 Green— Gray J207-9 U20-11	Flipper Grounded Switches
ROW										
Org-Brn J205-1 Left Coin Chute D1	White—Brown J209-1 U18-11 1	BALL LAUNCH 11	SLAM TIILT 21	TROUGH STACK 31	RIGHT POPPER 1 41	DROP TARGET 51	EJECT HOLE 61	NOT USED 71	NOT USED 81	Black—Green J906-1 Lower Right E.O.S. F1
Org-Red J205-2 Center Coin Chute D2	White—Red J209-2 U18-9 2	NOT USED 12	COIN DOOR CLOSED 22	TROUGH 1 (RIGHT) 32	RIGHT POPPER 2 42	NOT USED 52	LEFT LOOP 62	NOT USED 72	NOT USED 82	Blue—Violet J905-1 Lower Right Opto F2
Org-Blk J205-3 Right Coin Chute D3	White—Orange J209-3 U18-5 3	START BUTTON 13	BUY EXTRA BALL 23	TROUGH 2 33	NOT USED 43	NOT USED 53	LEFT RAMP ENTER 63	NOT USED 73	NOT USED 83	Black—Blue J906-3 Lower Left E.O.S. F3
Org-Yel J205-4 4th Coin Chute D4	White—Yellow J209-4 U18-7 4	PLUMB BOB TILT 14	ALWAYS CLOSED 24	TROUGH 3 34	NOT USED 44	LEFT WIREFORM 54	LEFT RAMP MIDDLE 64	NOT USED 74	NOT USED 84	Blue—Gray J905-2 Lower Left Opto F4
Org-Grn J205-6 Normal Test Service Escape Credit D5	White—Green J209-5 U19-11 5	SHOOTER LANE 15	KICKBACK 25	TROUGH 4 35	NOT USED 45	INNER LOOP 55	NOT USED 65	NOT USED 75	NOT USED 85	Black—Violet J906-4 Upper Right E.O.S. F5
Org-Blu J205-7 Normal Test Volume Down D6	White—Blue J209-7 U19-9 6	SPINNER 16	LEFT RETURN 26	NOT USED 36	LEFT MAGNET 46	LIGHT KICKBACK BOTTOM 56	RIGHT RAMP ENTER 66	NOT USED 76	NOT USED 86	Black—Yellow J905-3 Upper Right Opto F6
Org-Via J205-8 Normal Test Volume Up D7	White—Violet J209-8 U19-5 7	RIGHT OUTLANE 17	LEFT SLINGSHOT 27	CENTER TROUGH ENTER 37	CENTER MAGNET 47	LIGHT KICKBACK TOP 57	RIGHT RAMP EXIT 67	NOT USED 77	NOT USED 87	Black—Gray J906-5 Upper Left E.O.S. F7
Org-Gry J205-9 Normal Test Begin Test Test D8	White—Gray J209-9 U19-7 8	RIGHT RETRUN 18	RIGHT SLINGSHOT 28	LEFT TROUGH ENTER 38	RIGHT MAGNET 48	RIGHT LOOP 58	NOT USED 68	NOT USED 78	NOT USED 88	Black—Blue J905-5 Upper Left Opto F8

J2XX = CPU BOARD; J9XX = FLIPTRONIC II BOARD      [ ] = OPTO. TYPICALLY CLOSED

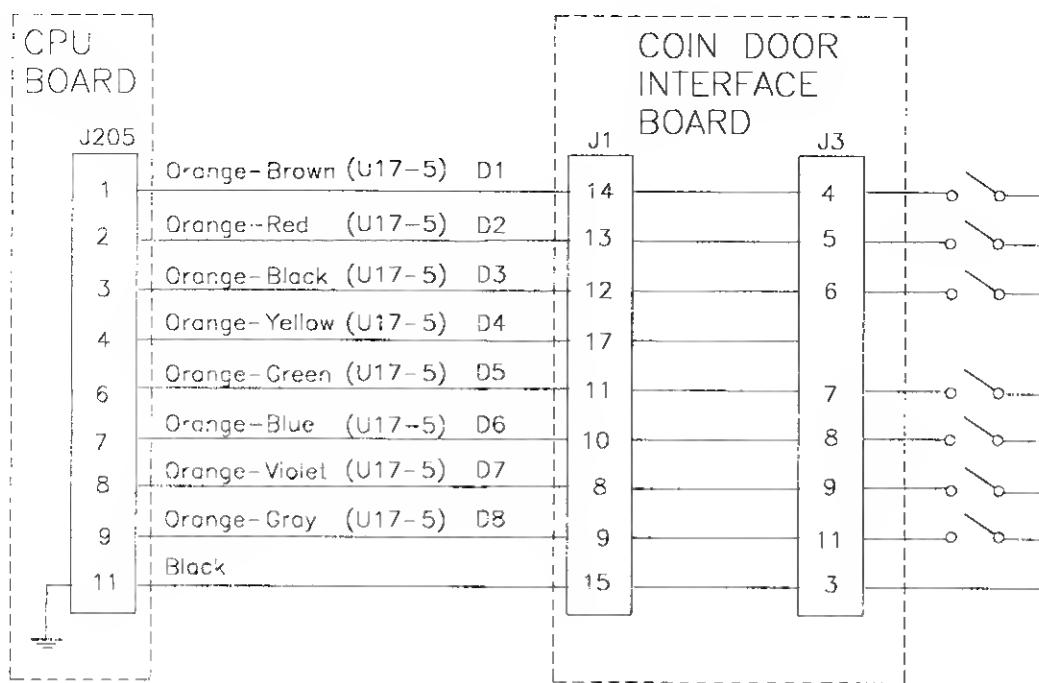
## SWITCH MATRIX CIRCUIT



The microprocessor is constantly strobing the column side of the switch. When point "A" on the column circuit toggles low, the column side is active.

When a switch closes, the row side of the circuit activates. The "+" input to the LM339 drops below +5V, therefore, its output is low. Corresponding row and column switches must be low at the same time for the switch to be considered closed by the microprocessor. When the switch opens, the "+" input to the LM339 is above +5V, its output is high and the row is inactive.

## DEDICATED SWITCHES



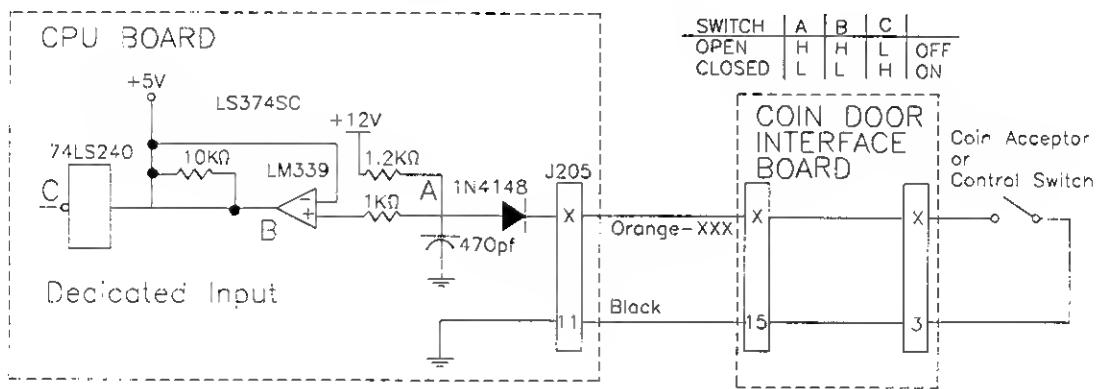
### Coin Acceptor Switches

D1 - Left Coin Chute  
 D2 - Center Coin Chute  
 D3 - Right Coin Chute  
 D4 - Fourth Coin Chute

### Control Switches

D5 - Normal Function, Service Credits; Test Function, Escape  
 D6 - Normal Function, Volume Down; Test Function, Down  
 D7 - Normal Function, Volume Up; Test Function, Up  
 D8 - Normal Function, Begin Test; Test Function, Enter

## DEDICATED SWITCH CIRCUIT



The dedicated switches operate similar in the matrix, except that instead of a column circuit there is a direct tie to ground. Therefore, the column side is constantly active (low).

When a switch closes, the row side (dedicated input) of the circuit activates. The "+" input to the LM339 drops below +5V, therefore the output is low. Since the row circuit (dedicated input) is tied directly to ground through the switch, the switch is considered closed by the microprocessor. When the switch opens, the "+" input to the LM339 is above +5V, its output is high and the row is inactive.

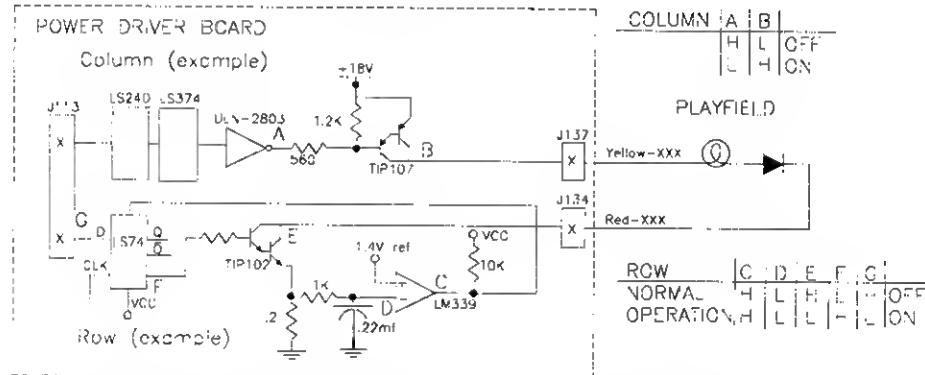
# LAMP MATRIX

YELLOW (B+) → RED

COL. JMN	1	2	3	4	5	6	7	8
ROW	Yellow-Brown J137-1 Q98	Yellow-Red J137-2 Q97	Yellow-Orange J137-3 Q96	Yellow-Black J137-4 Q95	Yellow-Green J137-5 Q94	Yellow-Blue J137-6 Q93	Yellow-Violet J137-7 Q92	Yellow-Grey J137-9 Q91
Red-Brown J134-1 Q80 1	RACEWAY AWARD 3	NO FEAR	SKULL	LEFT TRACK	RACEWAY	TUBE	LIGHT KICKBACK TOP	SHOOT AGAIN
Red-Block J134-2 Q89 2	RACEWAY AWARD 2	RACEWAY AWARD 4	RIGHT TRACK	FIRST PLACE	LEFT RAMP TURN	VIDEO MODE	LIGHT KICKBACK BOTTOM	LEFT SKULL EYE
Red Orange J134-4 Q88 3	RACEWAY AWARD 1	RACEWAY AWARD 5	CENTER JACKPOT	SECOND PLACE	SUPER SPINNER	RIGHT RAMP WIN	RIGHT FLIPPER LANE	JUMP NOW
Red-Yellow J134-5 Q87 4	LEFT OVER THE EDGE	RIGHT OVER THE EDGE	EXTRA BALL	THIRD PLACE	LEFT RAMP START	RIGHT RAMP TURN	RIGHT OUTLANE	SUPER JACKPOT
Red-Green J134-6 Q87 5	DIRT	AIR	START CHALLENGE	SKYDIVE	LEFT RAMP WIN	RIGHT RAMP START	HAIRPIN	RIGHT SKULL EYE
Red-Blue J134-7 Q86 6	ASPHALT	SNOW	CENTER JACKPOT	DROP JACKPOT	HILL CLIMB	LEFT FLIPPER LANE	DOWNSHILL	BALL LAUNCH
Red-Violet J134-8 Q84 7	NO LIMITS	FEAR FEST	RIGHT AUTOFIRE (2)	DROP LOCK	SCREAMER	LEFT OUTLANE	SUMMIT	BUY-IN BUTTON
Red-Grey J134-9 Q83 8	WATER	MEET YOUR MAKER	LEFT HURRY UP	LEFT AUTOFIRE (2)	NOT USED	KICKBACK	RIGHT HURRY UP	START BUTTON

J1XX = POWER DRIVER BOARD

## LAMP MATRIX CIRCUIT



The microprocessor sends a signal to the column circuit causing the output of the UNL-2803 to toggle. When point "A" drops low, the TIP107 transistor conducts and point "B" changes to a high state. At the same time, the microprocessor drives the input of the 74LS74 low, causing a high at output "F". A high state at the base of the TIP102 causes the transistor to conduct, bringing the row circuit to ground and turning the lamp on.

The microprocessor changes the input of the 74LS74 to a high state to turn the lamp off.

In overcurrent conditions, the lamp is shut off through the comparator. If the voltage at the negative input of the LM339 rises above 1.4V, the output changes to a low, which is fed back to the 74LS74 and shuts the row circuit off.

## SOLENOID/FLASHLAMP TABLE

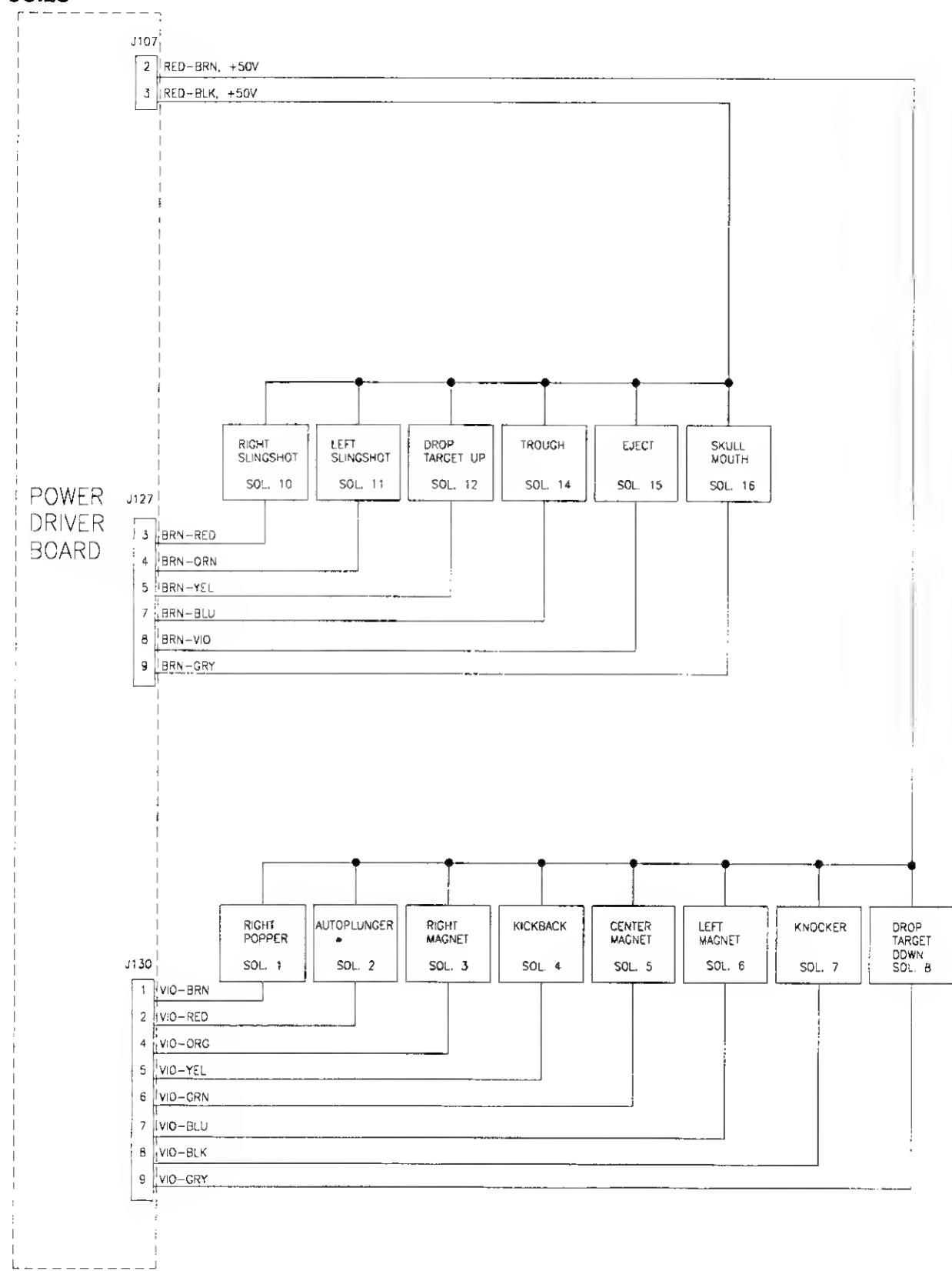
SOL. NO.	FUNCTION	SOLENOID TYPE	VOLTAGE CONNECTIONS			DRIVE XISTOR	DRIVE CONNECTIONS			DRIVE WIRE	SOLENOID PART NUMBER	
			PLAYFIELD	BACKBOX	CABINET		PLAYFIELD	BACKBOX	CABINET		PLAYFIELD	BACKBOX
01	RIGHT POPPER	High Power	J107-2			Q82	J130-1			VO-BRN	AE-23-800	
02	AUTO PLUNGER	High Power	J107-2			Q80	J130-2			VO-RED	AE-23-800	
03	RIGHT MAGNET	High Power	J107-2			Q78	J130-4			VO-ORG	20-10197-2*	
04	KICKBACK	High Power	J107-2			Q76	J'30-5			VO-YEL	AE-23-800	
05	CENTER MAGNET	High Power	J107-2			Q64	J'30-6			VO-GRN	20-10197-1*	
06	LEFT MAGNET	High Power	J107-2			Q66	J130-7			VO-BLU	20-10197*	
07	KNOCKER	High Power		J107-2		Q68		J130-8		VO-BLK		AE-23-800
08	DROP TARGET DOWN	High Power		J107-2		Q70		J130-9		VO-GRY	SM1-26-600*	
09	NOT USED	Low Power				Q58				BRN-BLK		
10	RIGHT SLINGSHOT	Low Power	J107-3			Q56	J127-3			BRN-RED	AE-26-1200	
11	LEFT SLINGSHOT	Low Power	J107-3			Q54	J'27-4			BRN-ORG	AE-26-1200	
12	DROP TARGET UP	Low Power	J107-3			Q52	J127-5			BRN-YEL	AE-26-1200	
13	NOT USED	Low Power				Q50				BRN-GRN		
14	TRough	Low Power	J107-3			Q48	J127-7			BRN-BLU	AE-26-500	
15	EJECT	Low Power	J107-3			Q46	J127-8			BRN-VIO	AE-27-700	
16	SKULL MOUTH	Low Power	J107-3			Q44	J127-9			BRN-GRY	SV 30-1100	
17	UPPER REAR FLS (2)	Flash lamp	J107-6			Q42	J126-1			BLK-BRN	#89 (2)	
18	INNER FLS	Flash lamp	J107-6			Q40	J126-2			BLK-RED	#906 (1)	
19	NO FEAR FLS	Flash lamp	J107-6			Q38	J126-3			BLK-ORG	#906 (1)	
20	RIGHT RAMP FLS (3)	Flash lamp	J107-6	JT06-5		Q36	J126-4	J125-5		BLK-YEL	#89 (1)	#906 (2)
21	SKULL FLS (3)	Flash lamp	J107-6	J'06-5		Q28	J126-5	J125-6		BLU-GRN	#906 (2)	#906 (1)
22	INSERT EXPLODE FLS	Flash lamp		JT06-5		Q30		J125-7		BLU-BLK	#905 (1)	
23	LEFT RAMP FLS (3)	Flash lamp	J107-6	J106-5		Q34	J'26-7	J125-8		BLU-VIO	#89 (1)	#906 (2)
24	TOP LEFT FLS	Flash lamp	J107-6			Q32	J'26-8			BLU-GRY	#906 (1)	
25	AUTOFIRE FLS (2)	Gen. Purpose	J107-6			Q26	J122-1			BLU-BRN	#89 (2)	
26	TOP LEFT INSERT FLS	Gen. Purpose		JT06-5		Q24		J'24-2		BLK-RED		#906 (1)
27	TOP RT INSERT FLS	Gen. Purpose		JT06-5		Q22		J'24-3		BLU-ORG		#906 (1)
28	RIGHT POPPER FLS	Gen. Purpose	J107-6			Q20	J122-4			BLU-YEL	#89 (1)	
29	56 SF FLIPPER CKTS											
37	NOT USED	Low Power				Q16				BRN-WHT		
38	NOT USED	Low Power				Q15				BLK-WHT		
39	NOT USED	Low Power				Q14				ORG-WHT		
40	NOT USED	Low Power				Q13				YEL-WHT		
41	NOT USED	Low Power				Q9				GRN-WHT		
42	NOT USED	Low Power				Q10				BLU-WHT		
43	NOT USED	Low Power				Q11				VIO-WHT		
44	NOT USED	Low Power				Q12				GRY-WHT		
<b>GENERAL ILLUMINATION</b>												
01	PLAYFIELD TOP	GL		J121-1		Q18		J121-7		WHT-BRN		#555
02	PLAYFIELD RGT	GL	J120-2	J121-2		Q10	J120-8	J121-8		WHT-ORG	#44	#555
03	PLAYFIELD LEFT	GL		J121-3		Q14		J121-9		WHT-YEL		#555
04	INSERT TILT	GL		JT20-5		Q16	J120-10			WHT-GRN	#44	
05	INSERT BACKGROUND	GL		J120-6		J119-3	J120-11		J119-	WHT-VIO	#44	
<b>FLIPPER CIRCUITS</b>												
VOLTAGE CONNECTION			POWER	DRIVE X-STOR	DRIVE CONNECTION	POWER	DRIVE WIRE	COIL PART NUMBER	COI COLOR			
FLIPPER CIRCUITS			POWER	Q4	J902-3	YEL-GRN						
29	LOWER RGT FLIPPER	Power	J907-1 (RED-GRN)	Q4	J902-3	YEL-GRN						
30	LOWER RGT FLIPPER	Hold	J907-1 (RED-GRN)	Q11	J902-1	ORG-GRN	FL-11629	BLU				
31	LOWER LEFT FLIPPER	Power	J907-4 (RED-BLU)	Q3	J902-9	YEL-BLU						
32	LOWER LEFT FLIPPER	Hold	J907-4 (RED-BLU)	Q6	J902-7	ORG-BLU	FL-11629	BLU				
33	UPPER RGT FLIPPER	Power	J907-6 (RED-VIO)	Q2	J902-6	YEL-VIO						
34	UPPER RGT FLIPPER	Hold	J907-6 (RED-VIO)	Q7	J902-4	ORG-VIO	F-11629	BLU				
35	NOT USED	Power	J907-8 (RED-GRY)	Q1	J902-3	YEL-GRY	NOT USED	NOT USED				
36	UPPER LEFT FLIPPER	Hold	J907-8 (RED-GRY)	Q5	J902-1	ORG-GRY						

J1XX-X=POWER DRIVER BOARD; JX X=AUX. DRIVER BOARD; J9XX-X=FLIPERONIC I BOARD  
 24-6549=#44 BLUB; 24-8704=#89 BLUB; 24-8768=#555 BLUB; 24-8802=#906; 24-8825=#545

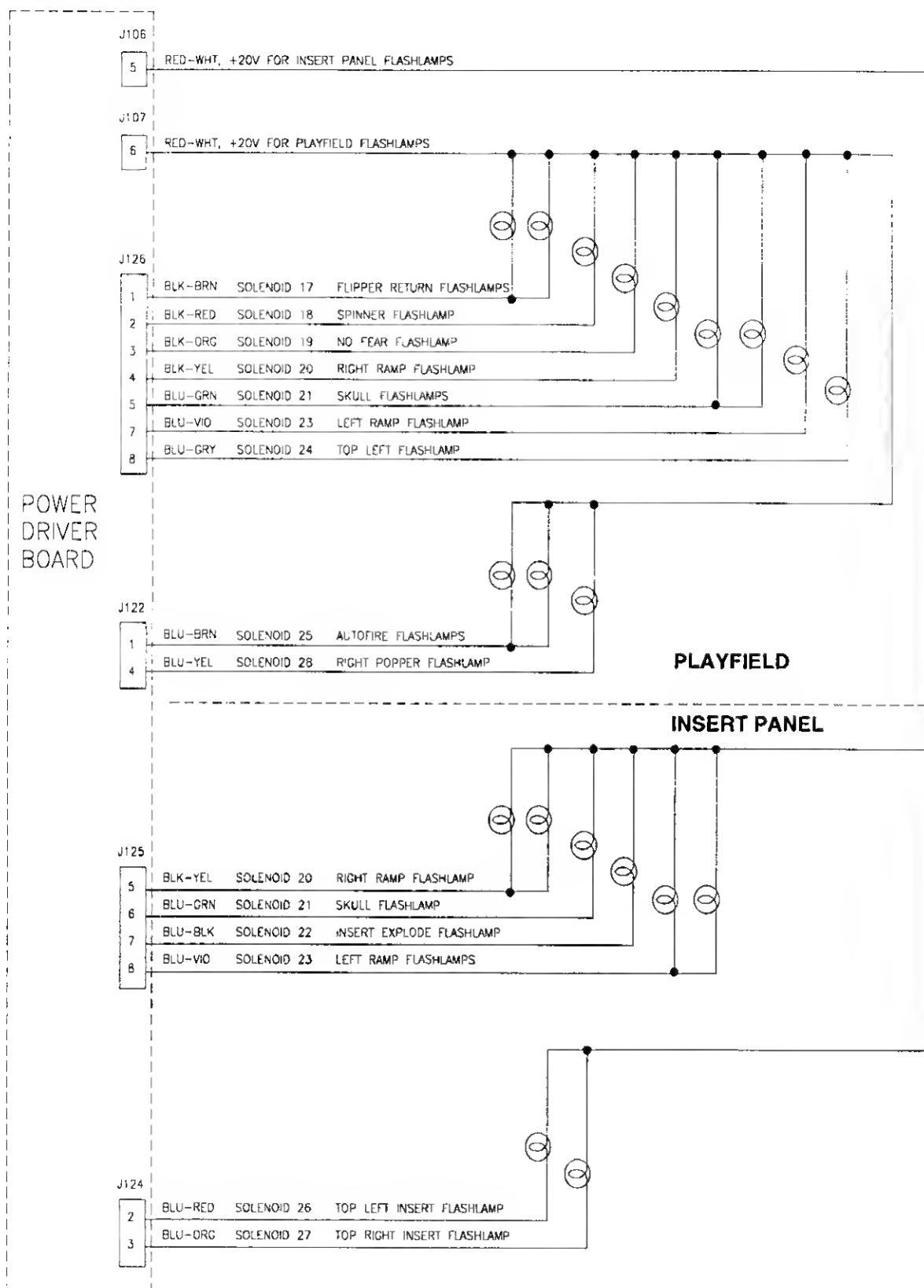
\* EACH MAGNET USES A WAVE SPRING WASHER; PART NUMBER 20-9612.

## SOLENOID WIRING

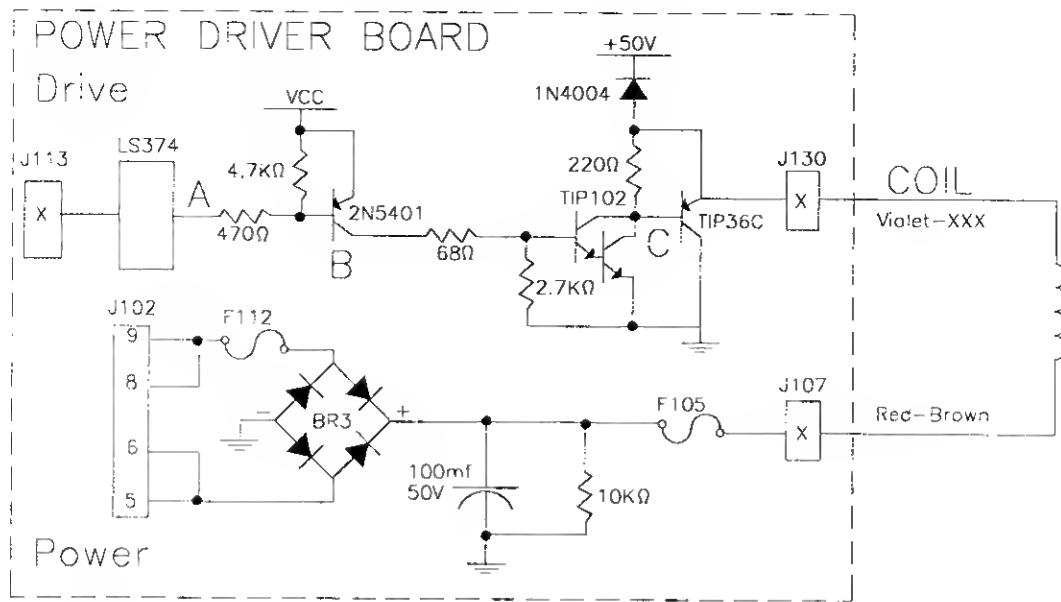
### COILS



## FLASHLAMPS

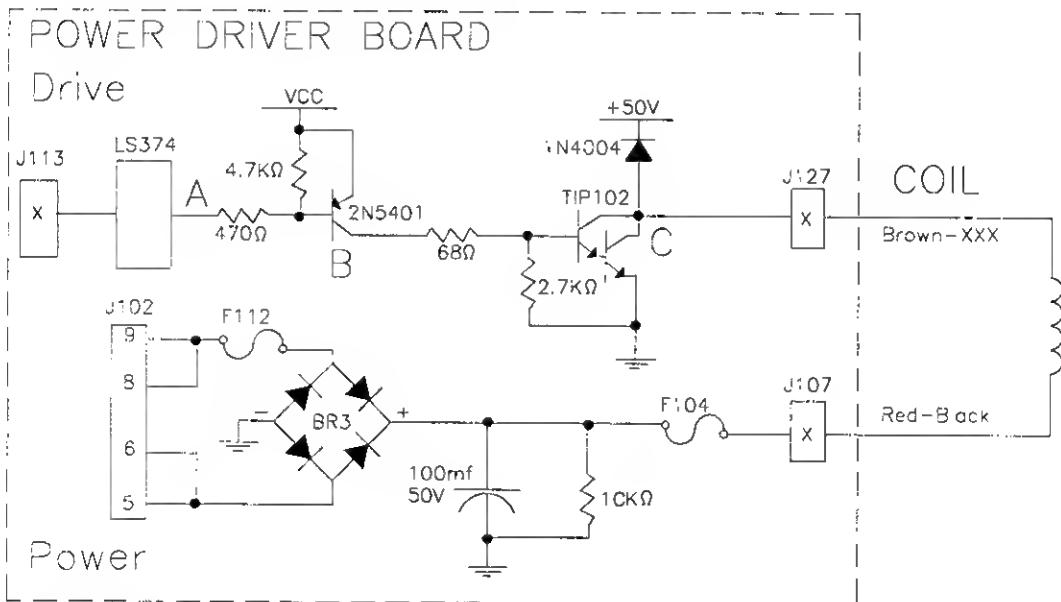


## HIGH POWER SOLENOID CIRCUIT



The microprocessor toggles the output of the 74LS374. When point "A" is low, point "B", the collector of the 2N5401 transistor, is high. A high at point "B" causes point "C", the collector of the TIP102 transistor and point "D", the emitter of the TIP36C transistor, to drop low. When point "D" is low, the coil is grounded through the transistor and turns on. The coil shuts off when point "A" toggles high.

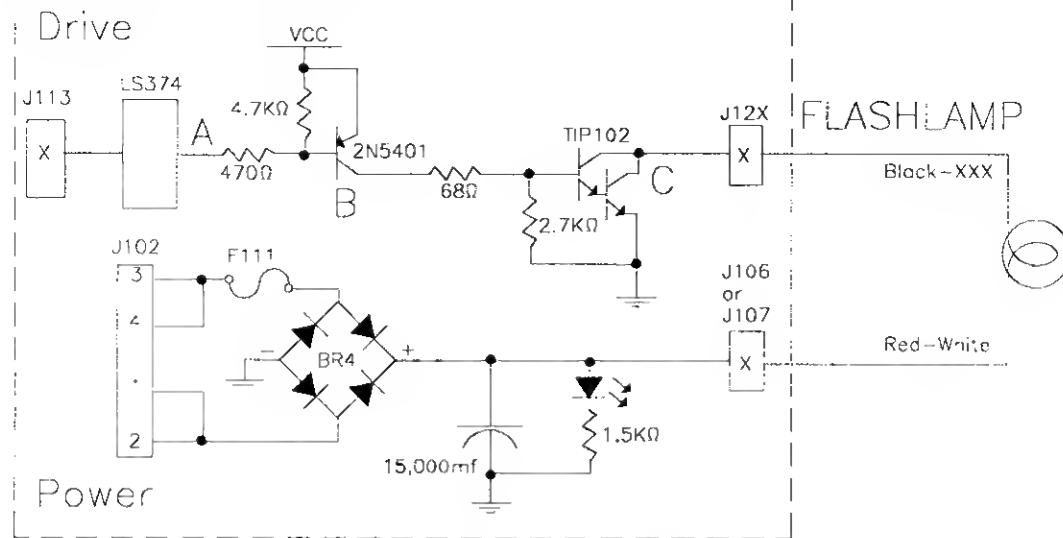
## **LOW POWER SOLENOID CIRCUIT**



The microprocessor toggles the output of the 74LS374. When point "A" is low, point "B", the collector of the 2N5401 transistor, is high. A high at point "B" turns on the TIP102 transistor and causes point "C" to drop low. When point "C" is low the coil is grounded through the transistor and turns on. The coil shuts off when point "A" toggles high.

## FLASHLAMP CIRCUIT

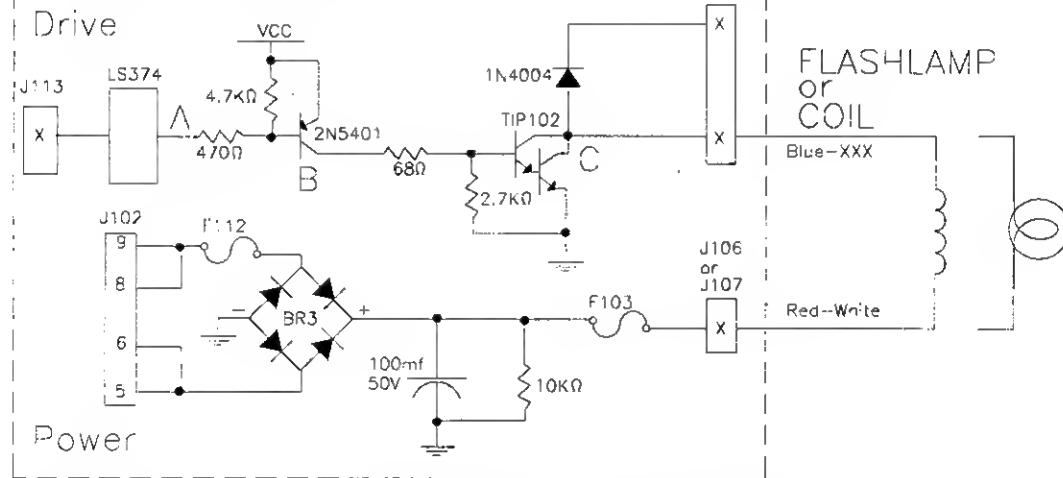
### POWER DRIVER BOARD



The microprocessor toggles the output of the 74LS374. When point "A" is low, point "B" the collector of the 2N5401 transistor, is high. Once point "B" is high, point "C" the collector of the TIP102 transistor is low. When point "C" is low, the flashlamp is grounded through the transistor and turns on. When point "A" toggles high, the current shuts off.

## SPECIAL (GENERAL PURPOSE) SOLENOID CIRCUIT

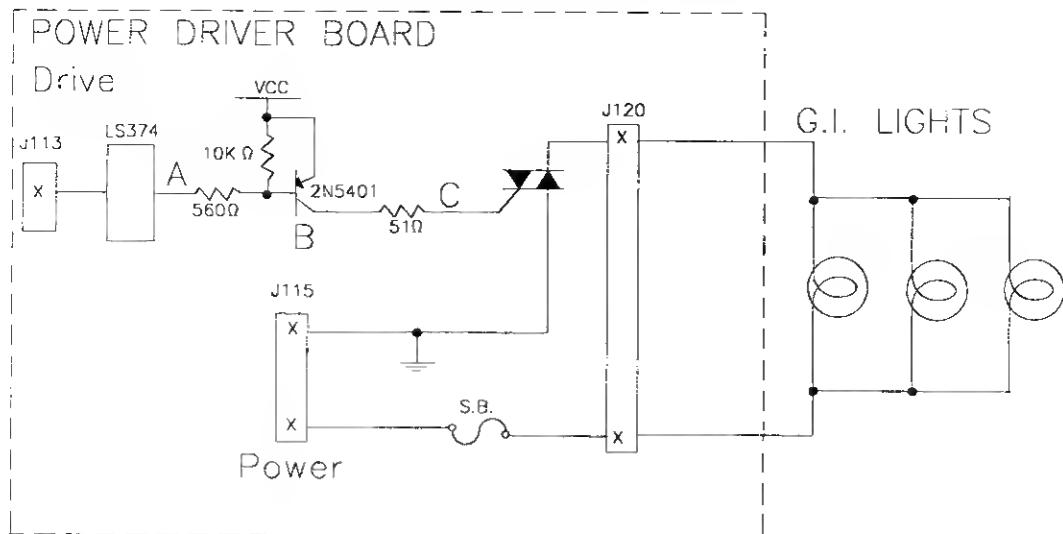
### POWER DRIVER BOARD



The microprocessor toggles the output of the 74LS374. When point "A" is low, point "B" the collector of the 2N5401 transistor , is high. A high at point "B" causes a low at point "C". When point "C" is low, the coil/flashlamp is grounded through the transistor and turns on. When point "A" toggles high the coil/flashlamp turns off.

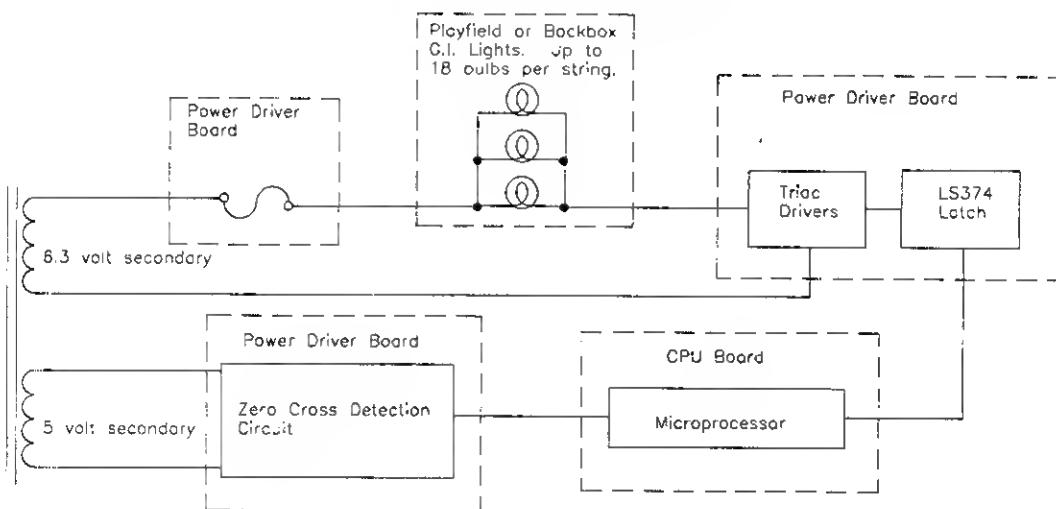
\* Tieback diode is not used for flashlamp circuit.

## GENERAL ILLUMINATION CIRCUIT

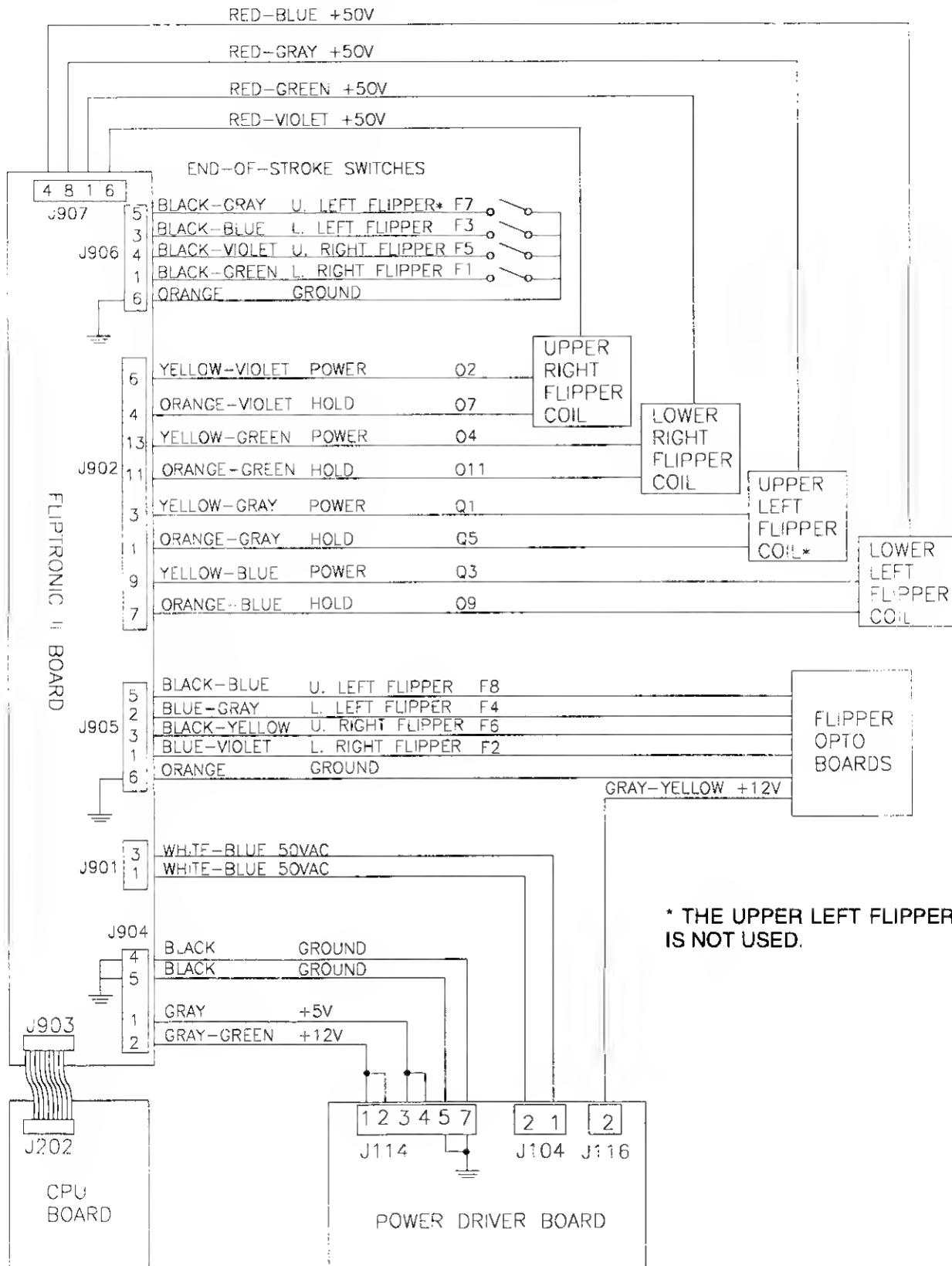


When point "A" toggles low, points, "B" and "C" are high. This turns on the triac and the desired general illumination string of lights.

## BLOCK DIAGRAM OF GENERAL ILLUMINATION CIRCUIT

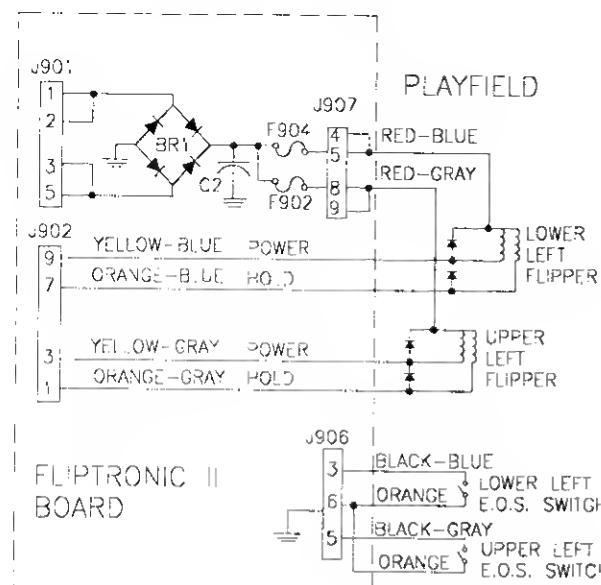


## FLIPPER CIRCUIT DIAGRAM

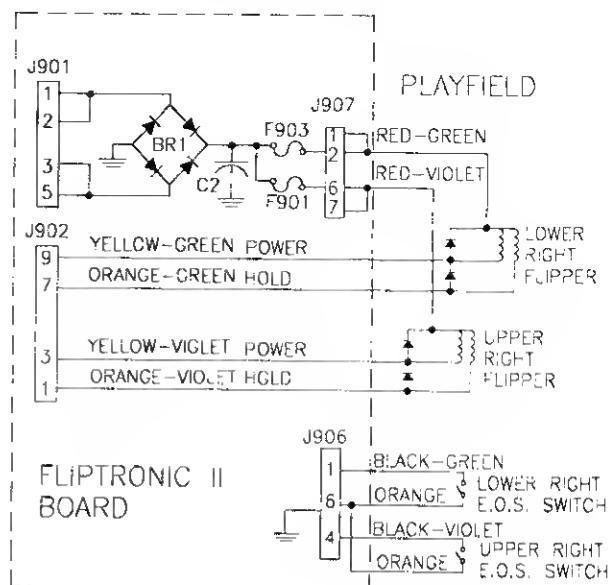


## FLIPPER COIL CIRCUIT

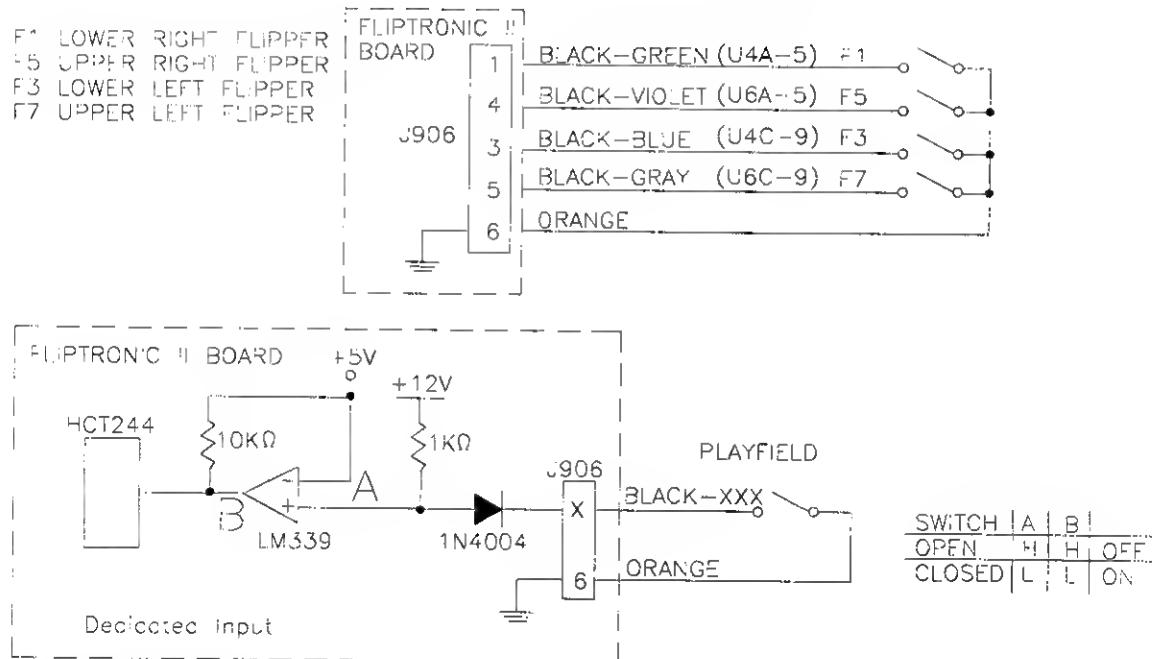
### LEFT FLIPPER CIRCUIT



### RIGHT FLIPPER CIRCUIT



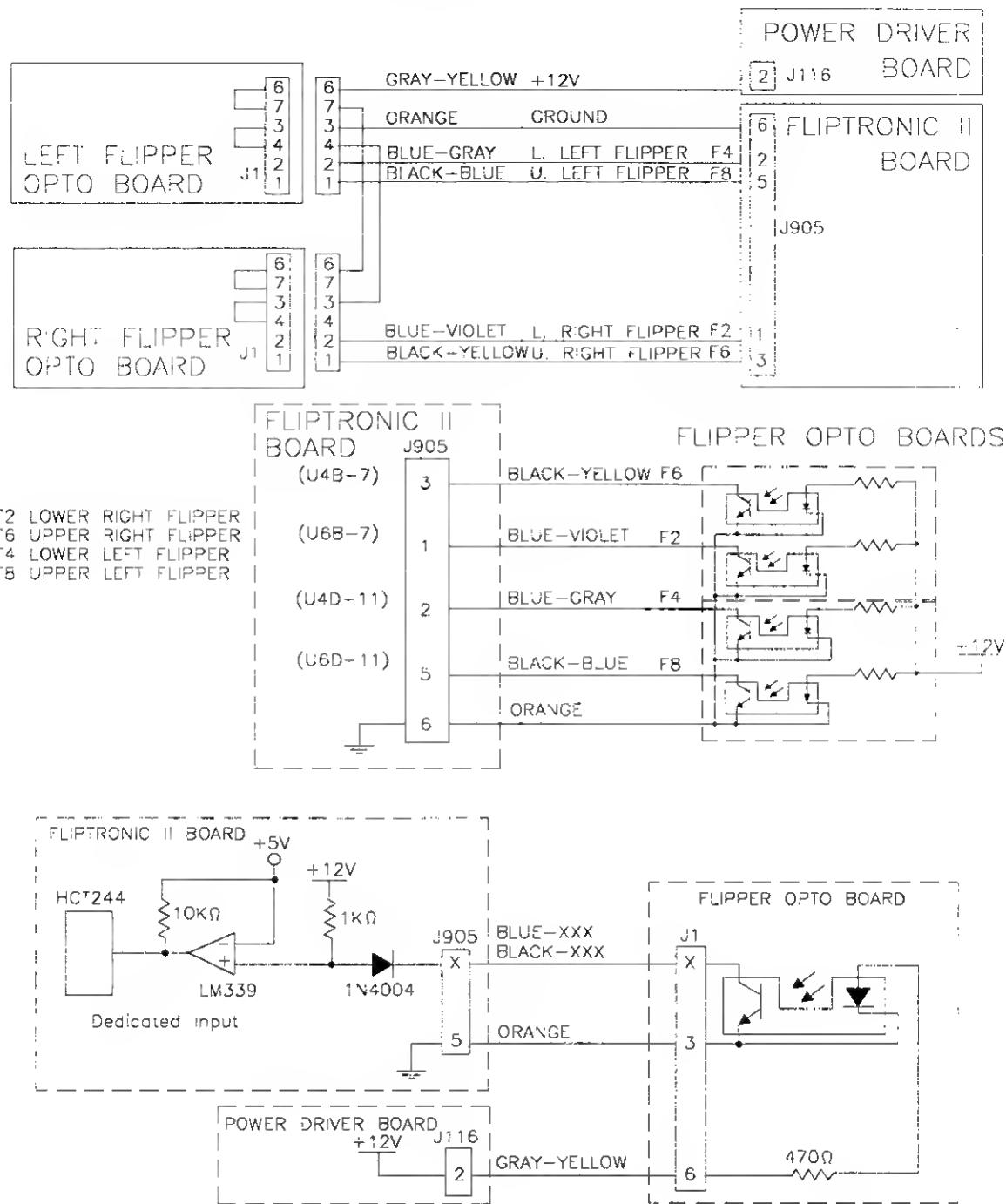
## FLIPPER END-OF-STROKE SWITCH CIRCUIT



The flipper E.O.S. circuits operate similar to the dedicated switch circuit. The circuits are active low and tied to ground through the switch.

When a switch closes, the row side, (dedicated input), of the circuit activates. The "+" input of the LM339 drops below +5V therefore its output is low. Since the row (dedicated input), circuit is tied directly to ground through the switch, the switch is considered closed by the microprocessor. When the switch opens, the "+" input to the LM339 is above +5V, its output is high and the row (dedicated input) is inactive.

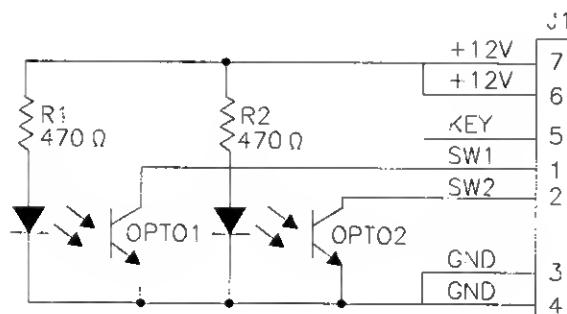
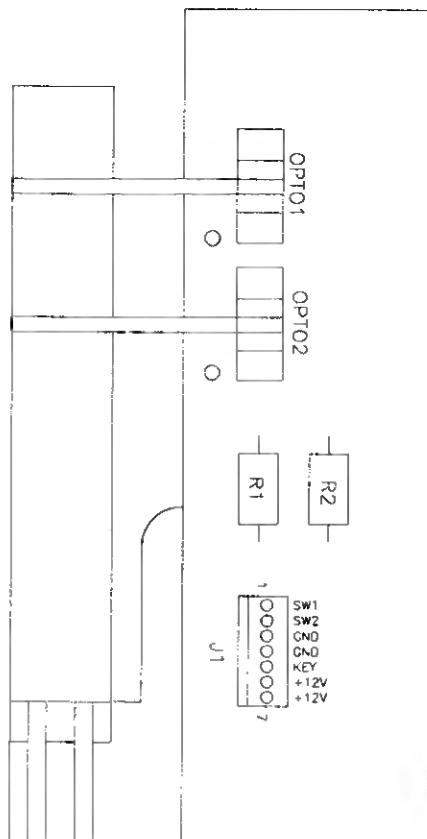
## FLIPPER CABINET SWITCH CIRCUIT



The flipper switch circuits operate similar to the dedicated switch circuit. The circuits are active low and tied to ground through the switch circuit.

When a switch closes, the row side (dedicated input) of the circuit activates. The "+" input to the LM339 drops below +5V, therefore, its output is low. Since the row, (dedicated input) circuit is tied directly to ground through the switch, the switch is considered closed by the microprocessor. When the switch opens, the "+" input to the LM339 is above +5V, its output is high and the row, (dedicated Input) is inactive.

## Flipper Opto Board Assembly A-17316



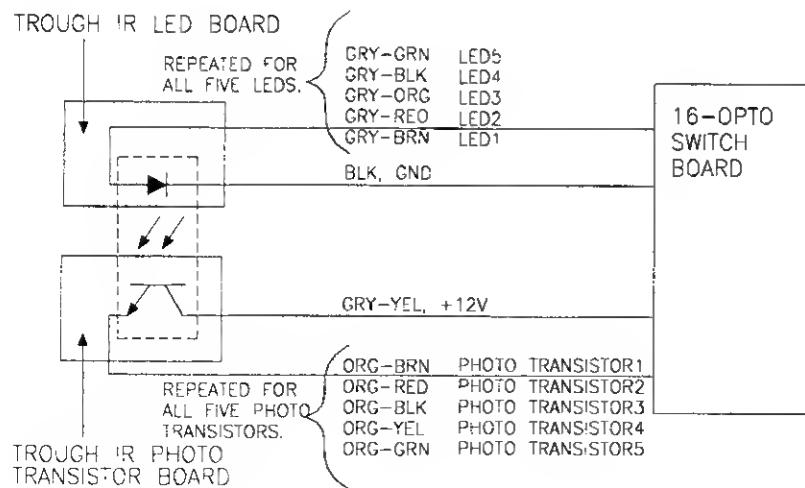
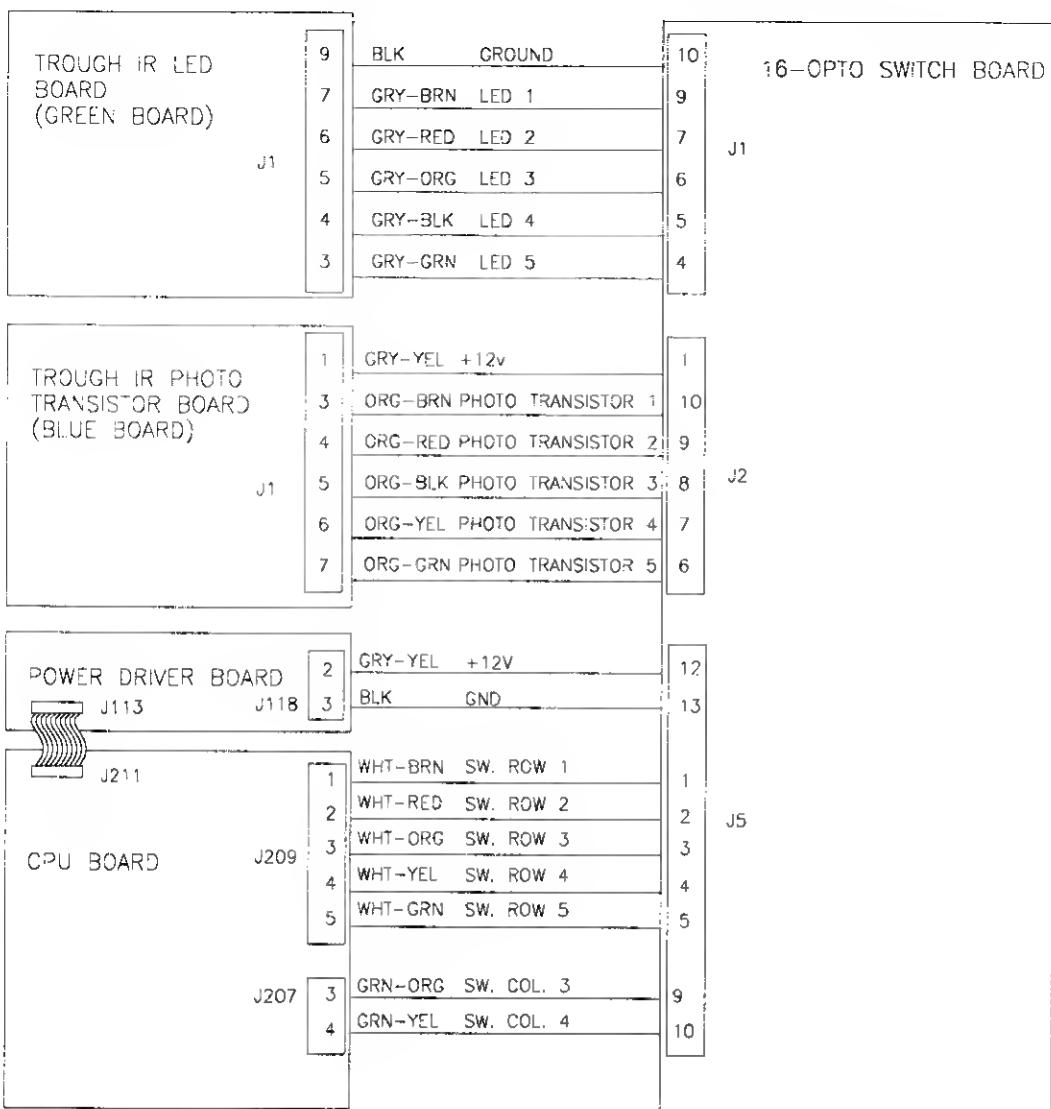
### Left Flipper Opto Board Assembly

- J1-1 Black-Blue from Fliptronic II Board J905-5
- J1-2 Blue-Gray from Fliptronic II Board J905-2
- J1-3 N/C
- J1-4 Orange from Fliptronic II Board J905-6
- J1-5 N/C
- J1-6 Gray-Yellow from Power Driver Board J116-2
- J1-7 Gray-Yellow from Power Driver Board J116-2

### Right Flipper Opto Board Assembly

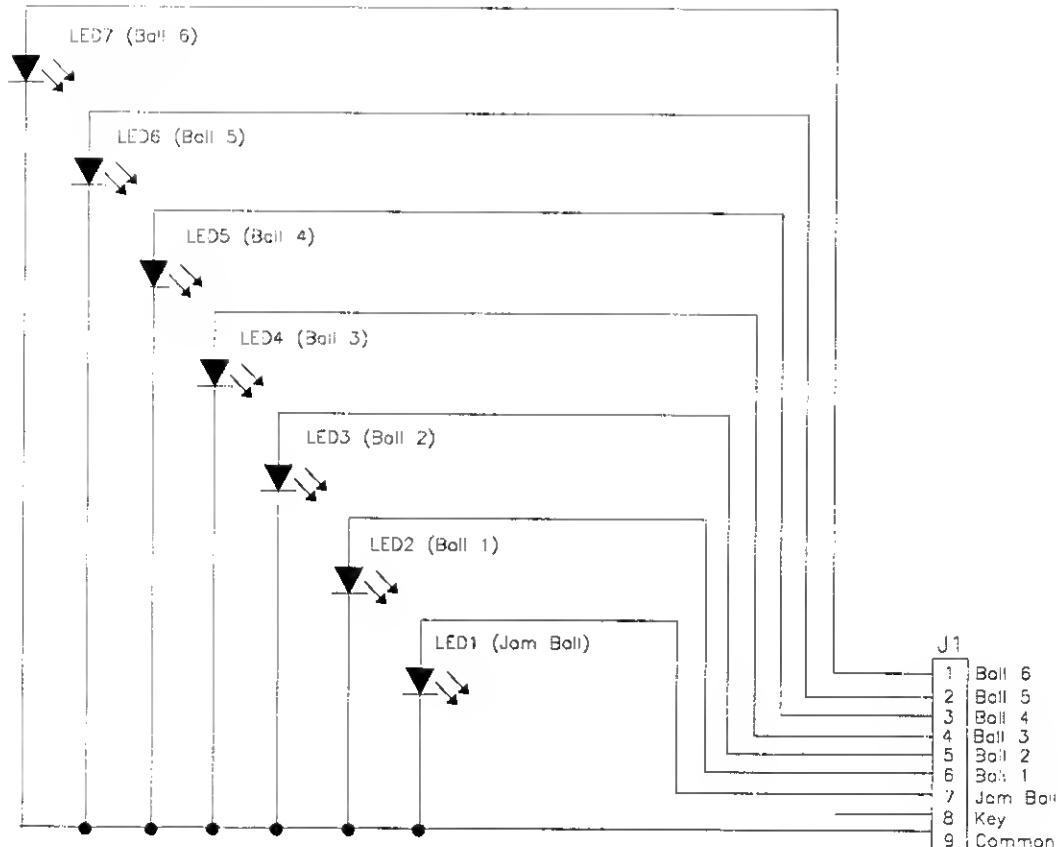
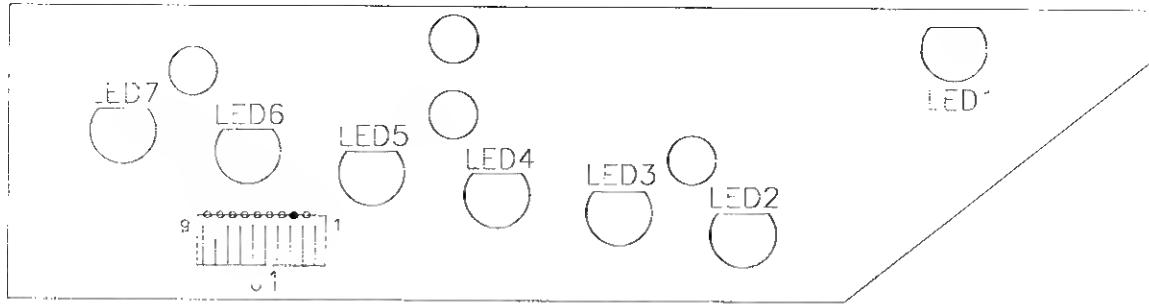
- J1-1 Black-Yellow from Fliptronic II Board J905-1
- J1-2 Blue-Violet from Fliptronic II Board J905-3
- J1-3 Orange from Fliptronic II Board J905-6
- J1-4 Orange from Left Flipper Opto Board Assy J1-4
- J1-5 N/C
- J1-6 Gray-Yellow from Left Flipper Opto Board Assy J1-6
- J1-7 N/C

## Outhole Trough Block Diagram



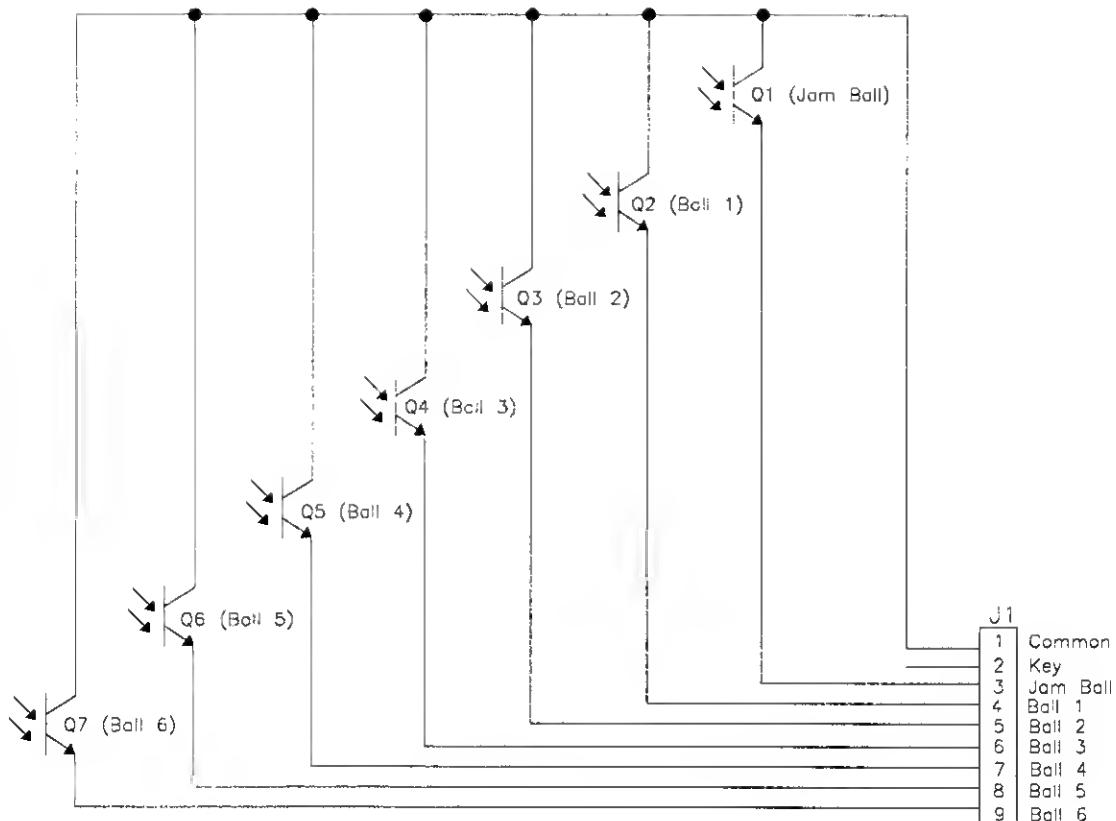
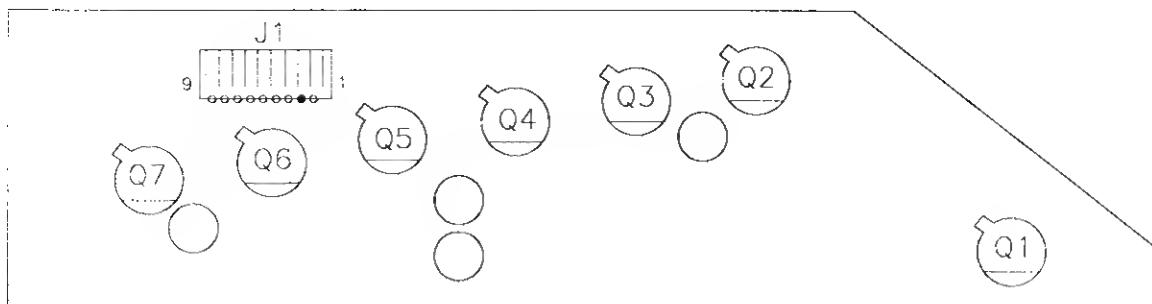
IN THE OUTHOLE TROUGH CIRCUIT, THE BALL ROLLS BETWEEN THE TRough IR LED BOARD AND THE TRough IR PHOTO TRANSISTOR BOARD AND BREAKS THE BEAM. WHEN THE BEAM IS BROKEN, THE SWITCH IS READ AS MADE.

**Trough IR LED Board Assembly  
(transmitter-green board)**  
**A-18617-1**



- J1-1 LED7, NOT USED
- J1-2 LED6, NOT USED
- J1-3 Gray-Green, LED5, to 16-Opto Switch Board J1-4
- J1-4 Gray-Black, LED4, to 16-Opto Switch Board J1-5
- J1-5 Gray-Orange, LED3, to 16-Opto Switch Board J1-6
- J1-6 Gray-Red, LED2, to 16-Opto Switch Board J1-7
- J1-7 Gray-Brown, LED1, to 16-Opto Switch Board J1-9
- J1-8 Key
- J1-9 Black, ground, to 16-Opto Switch Board J1-10

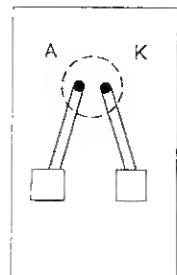
**Trough IR Photo Transistor Board Assembly  
(receiver-blue board)**  
**A-18618-1**



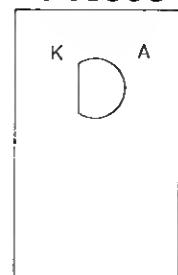
- J1-1 Gray-Yellow, +12V, to 16-Opto Switch Board J2-1
- J1-2 Key
- J1-3 Orange-Brown, Photo Transistor 1, to 16-Opto Switch Board J2-10
- J1-4 Orange-Red, Photo Transistor 2, to 16-Opto Switch Board J2-9
- J1-5 Orange-Black, Photo Transistor 3, to 16-Opto Switch Board J2-8
- J1-6 Orange-Yellow, Photo Transistor 4, to 16-Opto Switch Board J2-7
- J1-7 Orange-Green, Photo Transistor 5, to 16-Opto Switch Board J2-6
- J1-8 Photo Transistor 6, NOT USED
- J1-9 Photo Transistor 7, NOT USED

**LED Board Assembly  
(transmitter-green board)**

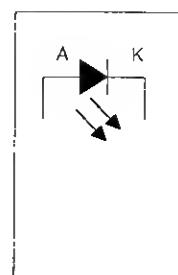
**A-16908**



solder side



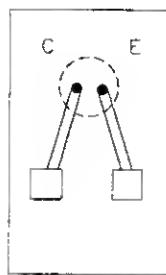
component side



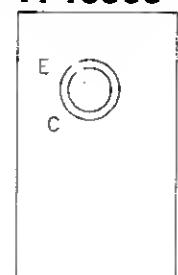
schematic

**Photo Transistor Board Assembly  
(receiver-blue board)**

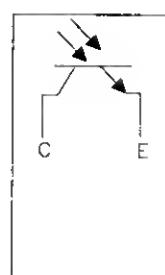
**A-16909**



solder side



component side



schematic

**Typical Circuit Diagram**

LED BOARD  
Transmitter  
1.0-1.4 volts

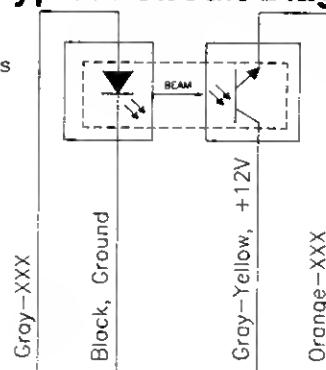
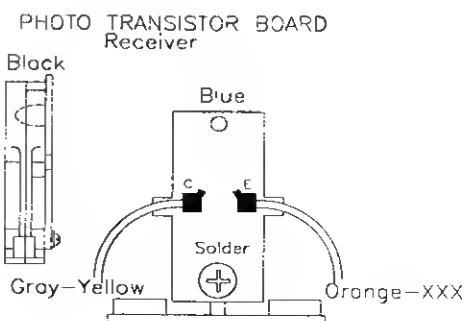
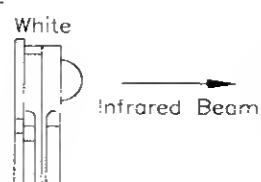
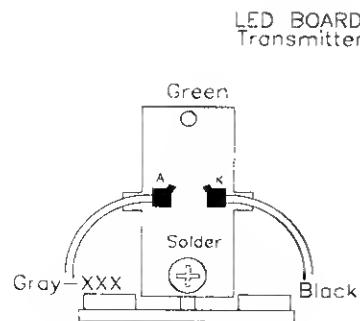
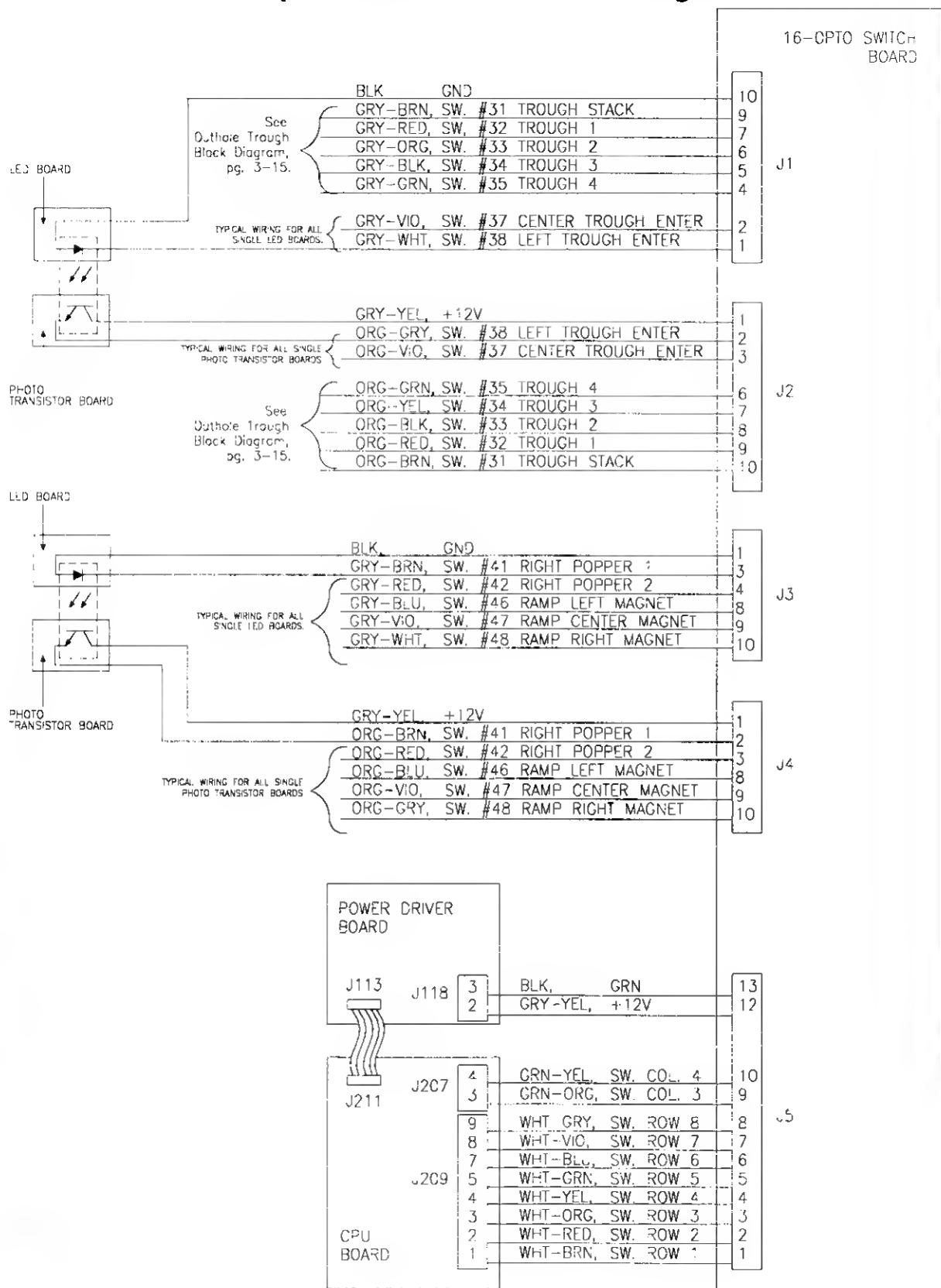


PHOTO TRANSISTOR BOARD  
Receiver  
0.1-0.7 volts unblocked  
11-13 volts blocked

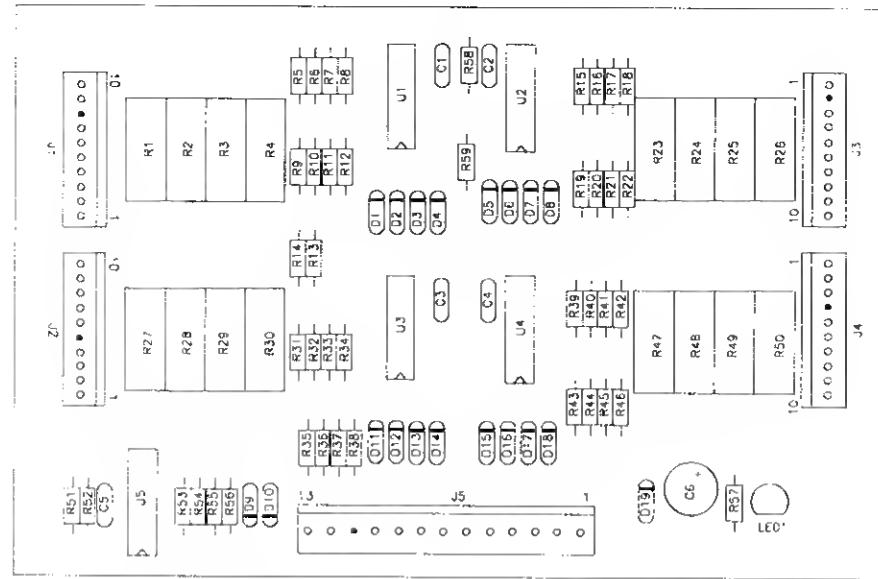


## 16-Opto Switch Board Circuit Diagram



# 16-Opto Switch Board Assembly

## A-16998.1



J1-1 GRY-WHT, to sw. #38, Left Trough Enter  
 J1-2 GRY-VIO, to sw. #37, Center Trough Enter  
 J1-3 N/C  
 J1-4 GRY-GRN, to sw. #35, Trough 4  
 J1-5 GRY-BLK, to sw. #34, Trough 3  
 J1-6 GRY-ORG, to sw. #33, Trough 2  
 J1-7 GRY-RED, to sw. #32, Trough 1  
 J1-8 KEY  
 J1-9 GRY-BRN, to sw. #31, Trough Stack  
 J1-10 BLK, Ground, to sw. #31 through sw. #38

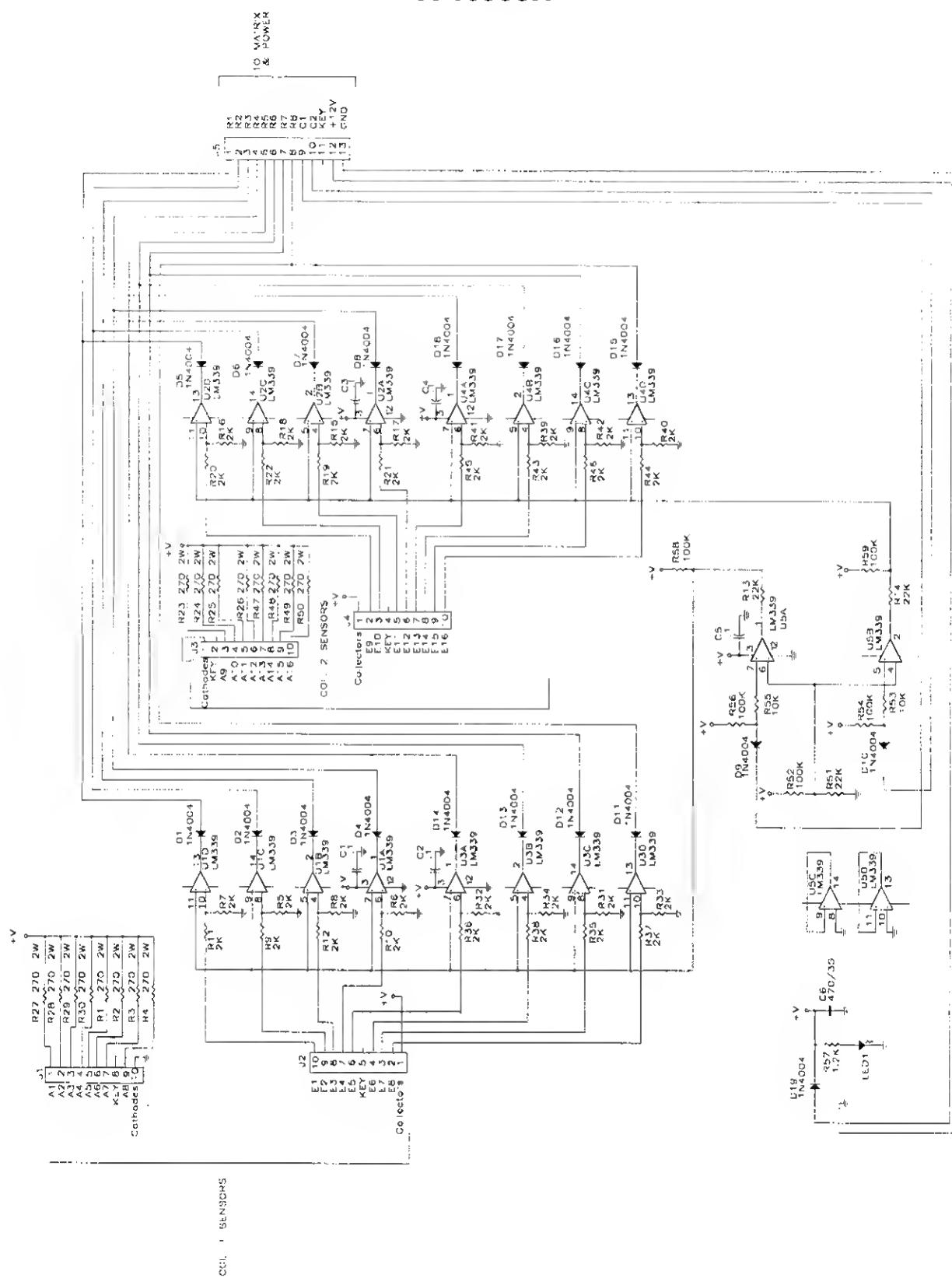
J2-1 GRY-YEL, +12V, to sw. #31 through sw. #38  
 J2-2 ORG-GRY, to sw. #38, Left Trough Enter  
 J2-3 ORG-VIO, to sw. #37, Center Trough Enter  
 J2-4 N/C  
 J2-5 KEY  
 J2-6 ORG-GRN, to sw. #35, Trough 4  
 J2-7 ORG-YEL, to sw. #34, Trough 3  
 J2-8 ORG-BLK, to sw. #33, Trough 2  
 J2-9 ORG-RED, to sw. #32, Trough 1  
 J2-10 ORG-BRN, to sw. #31, Trough Stack

J3-1 BLK, Ground, to sw. #41 through sw. #48  
 J3-2 KEY  
 J3-3 GRY-BRN, to sw. #41, Right Popper 1  
 J3-4 GRY-RED, to sw. #42, Right Popper 2  
 J3-5 N/C  
 J3-6 N/C  
 J3-7 N/C  
 J3-8 GRY-BLU, to sw. #46, Ramp Left Magnet  
 J3-9 GRY-VIO, to sw. #47, Ramp Center Magnet  
 J3-10 GRY-WHT, to sw. #48, Ramp Right Magnet

J4-1 GRY-YEL, +12V, to sw. #41 through sw. #48  
 J4-2 ORG-BRN, to sw. #41, Right Popper 1  
 J4-3 ORG-RED, to sw. #42, Right Popper 2  
 J4-4 KEY  
 J4-5 N/C  
 J4-6 N/C  
 J4-7 N/C  
 J4-8 ORG-BLU, to sw. #46, Ramp Left Magnet  
 J4-9 ORG-VIO, to sw. #47, Ramp Center Magnet  
 J4-10 ORG-GRY, to sw. #48, Ramp Right Magnet

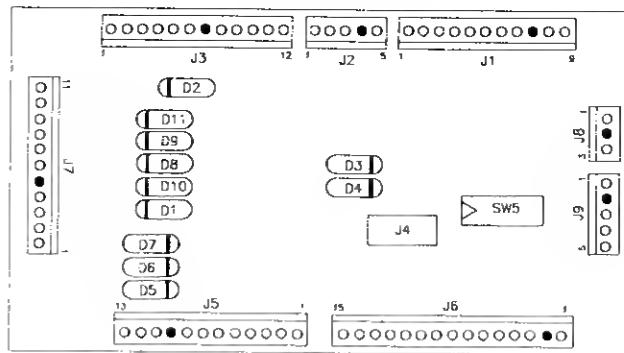
J5-1 WHT-BRN, sw. row 1, from CPU board J209-1  
 J5-2 WHT-RED, sw. row 2, from CPU board J209-2  
 J5-3 WHT-ORG, sw. row 3, from CPU board J209-3  
 J5-4 WHT-YEL, sw. row 4, from CPU board J209-4  
 J5-5 WHT-GRN, sw. row 5, from CPU board J209-5  
 J5-6 WHT-BLU, sw. row 6, from CPU board J209-7  
 J5-7 WHT-VIO, sw. row 7, from CPU board J209-8  
 J5-8 WHT-GRY, sw. row 8, from CPU board J209-9  
 J5-9 GRN-ORG, sw. col. 3, from CPU board J207-3  
 J5-10 GRN-YEL, sw. col. 4, from CPU board J207-4  
 J5-11 KEY  
 J5-12 GRY-YEL, +12V, from Power Driver board J118-2  
 J5-13 BLK, Ground, from Power Driver board J118-3

# 16-Opto Switch Board Assembly Schematic A-16998.1



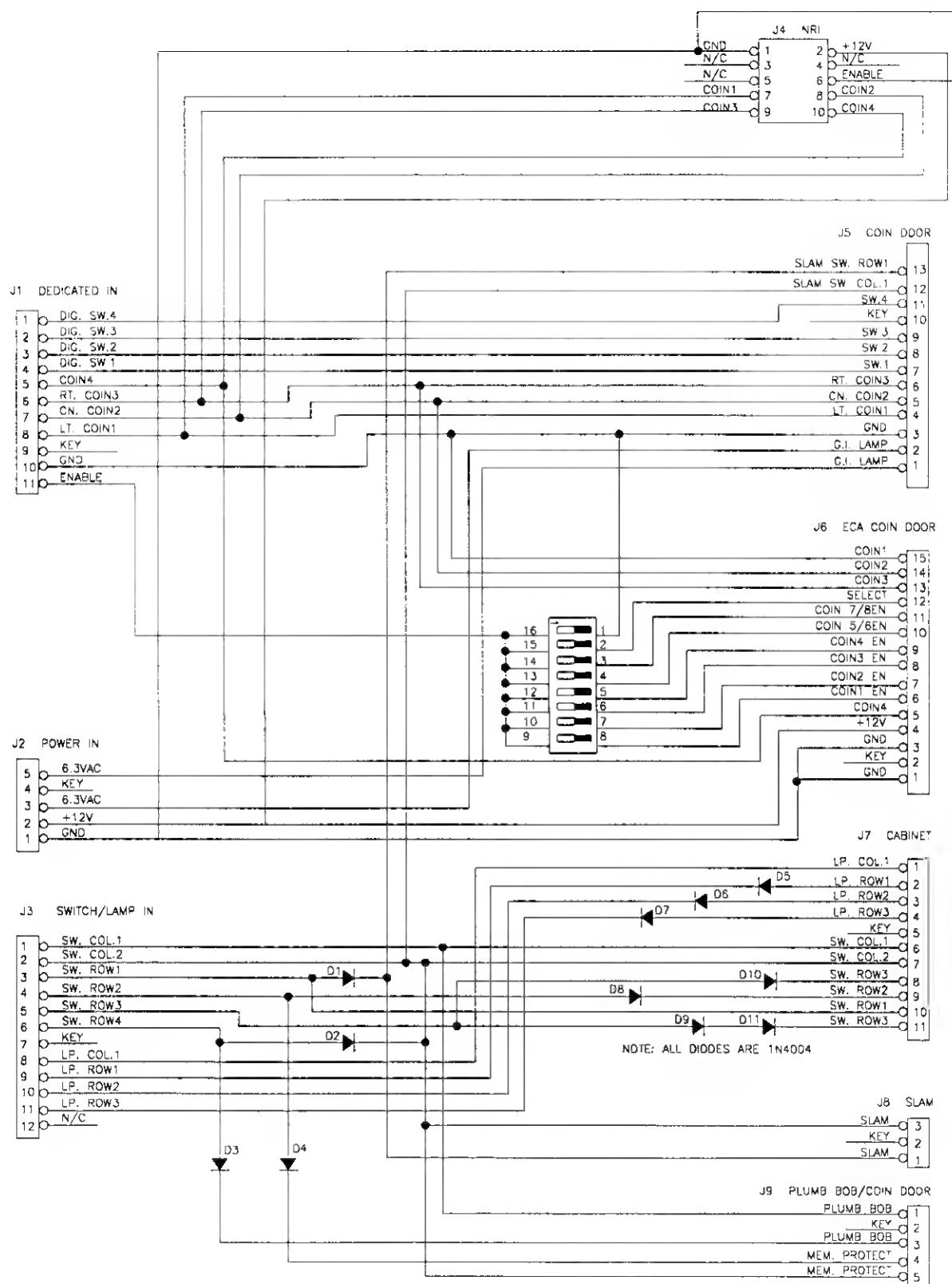
## Coin Door Interface Board

### A-17051-1



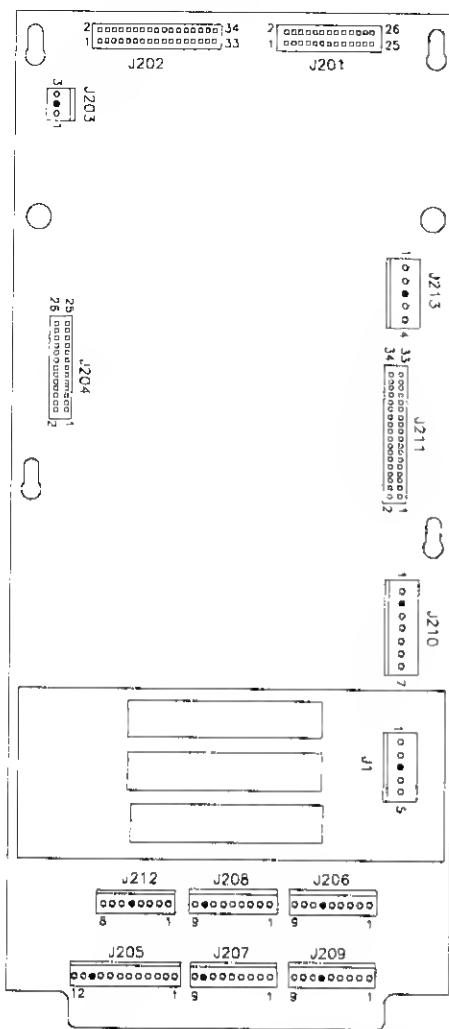
- |   |   |
|---|---|
| <p>J1-1 Orange-Gray, ded. switch row 8 from CPU J205-9<br/>         J1-2 Orange-Violet, ded. switch row 7 from CPU J205-8<br/>         J1-3 Orange-Blue, ded. switch row 6 from CPU J205-7<br/>         J1-4 Orange-Green, ded. switch row 5 from CPU J205-6<br/>         J1-5 Orange-Yellow, ded. switch row 4 from CPU J205-4<br/>         J1-6 Orange-Black, ded. switch row 3 from CPU J205-3<br/>         J1-7 Orange-Red, ded. switch row 2 from CPU J205-2<br/>         J1-8 Orange-Brown, ded. switch row 1 from CPU J205-1<br/>         J1-9 Key<br/>         J1-10 Black, ground from CPU J205-10<br/>         J1-11 Orange-White, switch enable from CPU J205-12</p> <p>J2-1 Black, ground from Power Driver Board J116-3<br/>         J2-2 Gray-Yellow, +12vac for Power Driver Board J116-2<br/>         J2-3 White-Violet, G.I. from Power Driver Board J119-1<br/>         J2-4 Key<br/>         J2-5 Violet, G.I. 6.8vac from Power Driver J119-3</p> <p>J3-1 Green-Brown, switch column 1 from CPU J212-1<br/>         J3-2 Green-Red, switch column 2 from CPU J212-2<br/>         J3-3 White-Brown, switch row 1 from CPU J212-4<br/>         J3-4 White-Red, switch row 2 from CPU J212-6<br/>         J3-5 White-Orange, switch row 3 from CPU J212-7<br/>         J3-6 White-Yellow, switch row 4 from CPU J212-8<br/>         J3-7 Key<br/>         J3-8 Yellow-Gray, lamp col. 8 from Power Driver J136-3<br/>         J3-9 Red-Blue, lamp row 6 from Power Driver J135-7<br/>         J3-10 Red-Violet, lamp row 7 from Power Driver J135-8<br/>         J3-11 Red-Gray, lamp row 8 from Power Driver J135-9</p> <p>J4- Not Used</p> | <p>J5-1 Violet, G.I. return to coin door<br/>         J5-2 White-Violet, G.I. 6.8vac to coin door<br/>         J5-3 Black, ground to coin door<br/>         J5-4 Orange-Brown, ded. switch row 1 to coin door<br/>         J5-5 Orange-Red, ded. switch row 2 to coin door<br/>         J5-6 N/C<br/>         J5-7 Orange-Green, ded. switch row 5 to coin door<br/>         J5-8 Orange-Blue, ded. switch row 6 to coin door<br/>         J5-9 Orange-Violet, ded. switch row 7 to coin door<br/>         J5-10 Key<br/>         J5-11 Orange-Gray, ded. switch row 8 to coin door<br/>         J5-12 Green-Brown, switch column 2 to coin door Slam Tilt<br/>         J5-13 White-Brown, switch row 1 to coin door Slam Tilt</p> <p>J6- Not Used</p> <p>J7-1 Yellow-Gray, lamp column 8 to cabinet<br/>         J7-2 Red-Blue, lamp row 6 to cabinet<br/>         J7-3 Red-Violet, lamp row 7 to cabinet<br/>         J7-4 Red-Gray, lamp row 8 to cabinet<br/>         J7-5 Key<br/>         J7-6 Green-Brown, switch column 1 to cabinet<br/>         J7-7 Green-Red, switch column 2 to cabinet<br/>         J7-8 White-Orange, switch row 3 to cabinet<br/>         J7-9 N/C<br/>         J7-10 White-Brown, switch row 1 to cabinet<br/>         J7-11 White-Orange, switch row 3 to cabinet</p> <p>J8-1 White, switch row to cabinet Slam Tilt<br/>         J8-2 Key<br/>         J8-3 Green, switch column to cabinet Slam Tilt</p> <p>J9-1 White-Yellow, switch row 4 to Plumb Bob Tilt<br/>         J9-2 Key<br/>         J9-3 Green-Brown, switch column 1 to Plumb Bob Tilt<br/>         J9-4 White-Red, switch row 2 to Interlock Switch<br/>         J9-5 Green-Red, switch column 2 to Interlock Switch</p> |
|---|---|

# Coin Door Interface Board Schematic A-17051-1



# Security CPU Board Assembly

## A-17651-50025



**J201:** 26-pin ribbon cable, data to/from J602

**J202:** 34-pin ribbon cable, data to/from J903; P1; J601

**J203- Not Used**

**J204- Not Used**

**J205-1** Orange-Brown, ded. sw. row 1, to Coin Door Brd J1-8

**J205-2** Orange-Red, ded. sw. row 2, to Coin Door Brd J1-7

**J205-3** Orange-Black, ded. sw. row 3, to Coin Door Brd J1-6

**J205-4** Orange-Yellow, ded. sw. row 4, to Coin Door Brd J1-5

**J205-5** Key

**J205-6** Orange-Green, ded. sw. row 5, to Coin Door Brd J1-4

**J205-7** Orange-Blue, ded. sw. row 6, to Coin Door Brd J1-3

**J205-8** Orange-Violet, ded. sw. row 7, to Coin Door Brd J1-2

**J205-9** Orange-Gray, ded. sw. row 8, to Coin Door Brd J1-1

**J205-10** Black, ground, to Coin Door Brd J1-10

**J205-11** N/C

**J205-12** Orange-White, switch enable, to Coin Door Brd J1-11

**J206- Not Used**

**J207-1** Green-Brown, switch column 1, to playfield switches

**J207-2** Green-Red, switch column 2, to playfield switches

**J207-3** Green-Orange, switch column 3, to playfield switches

**J207-4** Green-Yellow, switch column 4, to playfield switches

**J207-5** Green-Black, switch column 5, to playfield switches

**J207-6** Green-Blue, switch column 6, to playfield switches

**J207-7** N/C

**J207-8** Key

**J207-9** N/C

**J207-10** N/C

**J207-11** N/C

**J208- Not Used**

**J209-1** White-Brown, switch row 1, to playfield switches

**J209-2** White-Red, switch row 2, to playfield switches

**J209-3** White-Orange, switch row 3, to playfield switches

**J209-4** White-Yellow, switch row 4, to playfield switches

**J209-5** White-Green, switch row 5, to playfield switches

**J209-6** Key

**J209-7** White-Blue, switch row 6, to playfield switches

**J209-8** White-Violet, switch row 7, to playfield switches

**J209-9** White-Gray, switch row 8, to playfield switches

**J210-1** Black, ground, from Power Driver Board J114-5,7

**J210-2** Key

**J210-3** Black, ground, from Power Driver Board J114-5, 7

**J210-4** Gray, +5V, from Power Driver Board J114-3, 4

**J210-5** Gray, +5V, from Power Driver Board J114-3, 4

**J210-6** Gray-Green, +12V, from Power Driver Board J114-1, 2

**J210-7** Gray-Green, +12V, from Power Driver Board J114-1, 2

**J211:** 34-pin ribbon cable, data to/from J113

**J212-1** Green-Brown, switch col. 1, to Coin Door Board J3-1

**J212-2** Green-Red, switch col. 2, to Coin Door Board J3-2

**J212-3** N/C

**J212-4** White-Brown, switch row 1, to Coin Door Board J3-3

**J212-5** Key

**J212-6** White-Red, switch row 2, to Coin Door Board J3-4

**J212-7** White-Orange, switch row 3, to Coin Door Board J3-5

**J212-8** White-Yellow, switch row 4, to Coin Door Board J3-6

**J213-1** Black, to battery holder board J1-1

**J213-2** Black, to battery holder board J1-2

**J213-3** Key

**J213-4** Gray, to battery holder board J1-4

**J213-5** Gray, to battery holder board J1-5

**J1-1** Black, from CPU J213-1

**J1-2** Black, from CPU J213-2

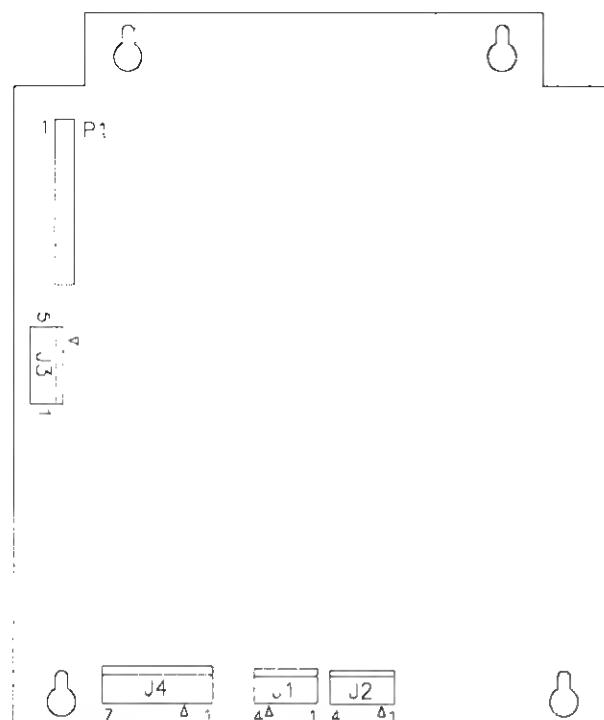
**J1-3** Key

**J1-4** Gray, from CPU J213-4

**J1-5** Gray, from CPU J213-5

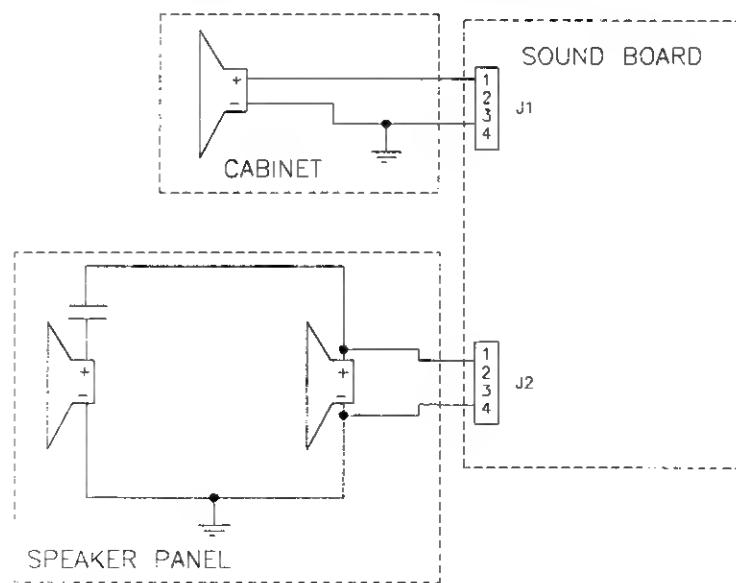
# Sound Board Assembly

## A-16917-50025



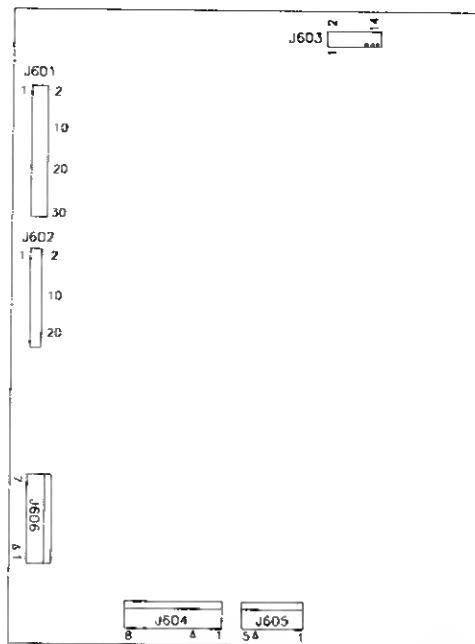
- P1, 34-pin ribbon cable, data to/from J601; J903;  
J202
- J1-1 Black-Yellow, signal to speaker  
J1-2 N/C  
J1-3 Key  
J1-4 Black, signal to speaker
- J2-1 Black-Yellow, signal to speaker  
J2-2 Key  
J2-3 N/C  
J2-4 Black, signal to speaker
- J3-1 Gray, +5V from Power Driver Board J114-3, 4  
J3-2 Key  
J3-3 Gray, +5V from Power Driver Board J114-3, 4  
J3-4 Black, ground from Power Driver Board J114-5, 7  
J3-5 Black, ground from Power Driver Board J114-5, 7
- J4-1 Gray-Green, 18Vac from transformer secondary  
J4-2 Gray-Green, 18Vac loop from J4-1  
J4-3 Key  
J4-4 Gray, 18Vac from transformer secondary  
J4-5 Gray, 18Vac loop from J4-4  
J4-6 Gray-White, 18Vac from transformer secondary  
J4-7 Gray-White, 18Vac loop from J4-6

### Speaker Wiring Diagram



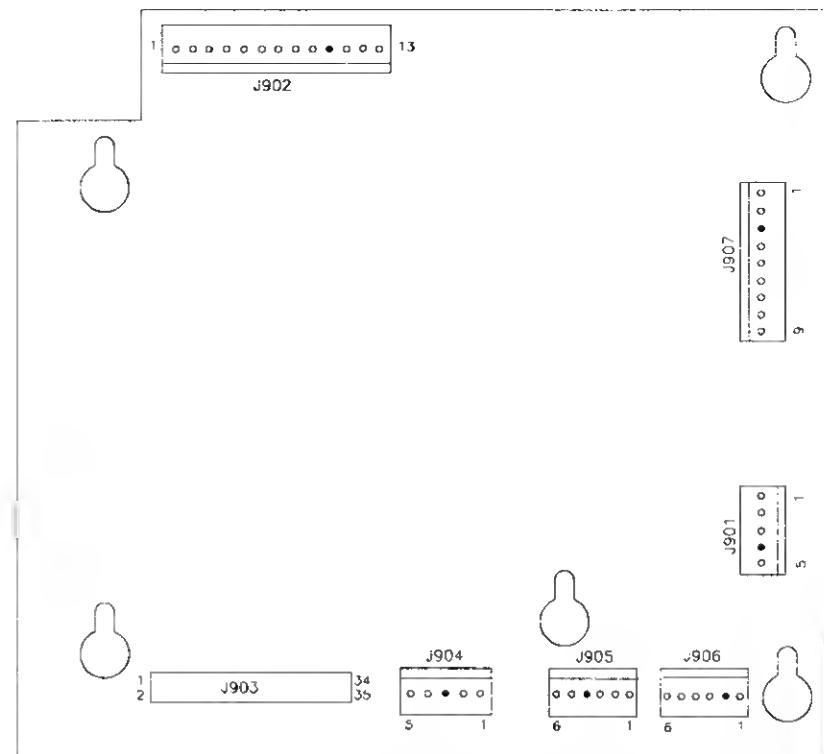
# Dot Matrix Controller Board Assembly

## A-14039.1



- J601, 34-pin ribbon cable, data to/from J202; J903; P1
- J602, 26-pin ribbon cable, data to/from J201
- J603, 14-pin ribbon cable, data to/from Dot Matrix Display/Driver
- J604-1 Orange, -125V to Display/Driver pin 1  
 J604-2 Blue, -113V to Display/Driver pin 2  
 J604-3 Key  
 J604-4 Black, ground to Display/Driver pin 4  
 J604-5 Black, ground to Display/Driver pin 5  
 J604-6 Gray, +5V to Display/Driver pin 6  
 J604-7 Gray-Yellow, to Display/Driver pin 7  
 J604-8 Brown, +62V to Display/Driver pin 8
- J605-1 White, 80Vac from transformer secondary  
 J605-2 White, 80Vac from transformer secondary  
 J605-3 Violet, 100Vac from transformer secondary  
 J605-4 Key  
 J605-5 Violet, 100Vac from transformer secondary
- J606-1 Black, ground loop from J606-3  
 J606-2 Key  
 J606-3 Black, ground from Power Driver Board J117-3  
 J606-4 Gray, +5V loop from J606-5  
 J606-5 Gray, +5V from Power Driver Board J117-4  
 J606-6 Gray-Yellow, +12V loop from J606-7  
 J606-7 Gray-Yellow, +12V from Power Driver Board J117-2

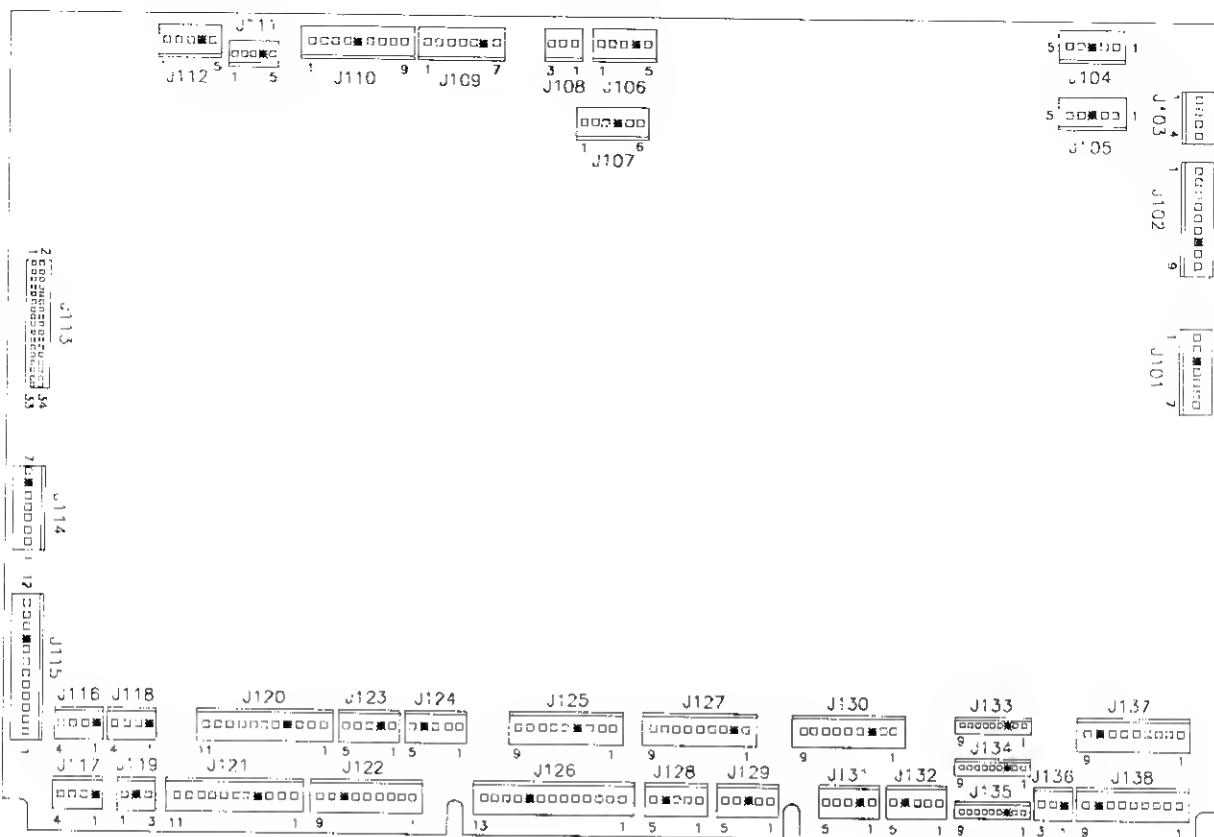
## Fliptronic II Board Assembly A-15472-1



J901-1	White-Blue, 50Vac from Power Drvr Brd J104-2	J905-1	Blue-Violet, F2 to right flipper opto J1-2
J901-2	White-Blue, 50Vac loop from J901-1	J905-2	Blue-Gray, F4 to left flipper opto J1-2
J901-3	White-Blue, 50Vac from Power Drvr Brd J104-1	J905-3	Black-Yellow, F6 to right flipper opto J1-1
J901-4	Key	J905-4	Key
J901-5	White-Blue, 50Vac loop from J901-3	J905-5	Black-Blue, F8 to left flipper opto J1-1 (not used)
J902-1	N/C	J905-6	Orange, ground to left flipper opto J1-4
J902-2	N/C	J906-1	Black-Green, F1 to lower right E.O.S. switch
J902-3	N/C	J906-2	Key
J902-4	Orange-Violet, holding, upper right flipper coil	J906-3	Black-Blue, F3 to lower left E.O.S. switch
J902-5	N/C	J906-4	Black-Violet, F5 to upper right E.O.S. switch
J902-6	Yellow-Violet, power, upper right flipper coil	J906-5	N/C
J902-7	Orange-Blue, holding, lower left flipper coil	J906-6	Orange, ground to E.O.S. switches
J902-8	N/C	J907-1	Red-Green, +50V to lower right flipper coil
J902-9	Yellow-Blue, power, lower left flipper coil	J907-2	Red-Green, +50V loop from J907-1
J902-10	Key	J907-3	Key
J902-11	Orange-Green, holding, lower right flipper coil	J907-4	Red-Blue, +50V to lower left flipper coil
J902-12	N/C	J907-5	Red-Blue, +50V loop from J907-4
J902-13	Yellow-Green, power, lower right flipper coil	J907-6	Red-Violet, +50V to upper right flipper coil
J903,	34-pin ribbon cable, data to/from J202; J601; P1	J907-7	Red-Violet, +50V loop from J907-6
J904-1	Gray, +5V from Power Driver Board J114-3, 4	J907-8	N/C
J904-2	Gray-Green, +12V from Pwr Drvr Brd J114-1, 2	J907-9	N/C
J904-3	Key		
J904-4	Black, ground from Power Driver Brd J114-5, 7		
J904-5	Black, ground from Power Driver Brd J114-5, 7		

# Power Driver Board Assembly

## A-12697-3



- |        |   |         |  |
|--------|---|---------|--|
| J101-1 | Red, 9Vac from xformer secondary                | J106- 1 | N/C  |
| J101-2 | Red, 9Vac from transformer secondary            | J106-2  | N/C  |
| J101-3 | Key   | J106-3  | N/C  |
| J101-4 | Blue-White, 13Vac from xformer secondary        | J106-4  | Key  |
| J101-5 | Blue-White, 13Vac loop from J101-4              | J106-5  | Red-White, +20V to insert panel flashlamps |
| J101-6 | Blue-White, 13Vac from xformer secondary        | J107-1  | Red-Brown, +50V to coils                   |
| J101-7 | Blue-White, 13Vac loop from J101-6              | J107-2  | Red-Black, +50V to coils                   |
| J102-1 | White-Red, 16Vac loop from J102-2               | J107-3  | N/C  |
| J102-2 | White-Red, 16Vac from xformer secondary         | J107-4  | Key  |
| J102-3 | White-Red, 16Vac loop from J102-4               | J107-5  | N/C  |
| J102-4 | White-Red, 16Vac from xformer secondary         | J107-6  | Red-White, +20V to playfield flashlamps    |
| J102-5 | Black-Yellow, 16Vac loop from J102-6            | J108-   | Not Used                                   |
| J102-6 | Black-Yellow, 16Vac from xformer secondary      | J109-   | Not Used                                   |
| J102-7 | Key   | J110-   | Not Used                                   |
| J102-8 | Black-Yellow, 16Vac loop from J102-9            | J111-   | Not Used                                   |
| J102-9 | Black-Yellow, 16Vac from xformer secondary      | J112-1  | White-Green, 9.8Vac from xformer secondary |
| J103-  | Not Used  | J112-2  | White-Green, 9.8Vac loop from J112-1       |
| J104-1 | White-Blue, 50Vac to Fliptronic II Board J901-3 | J112-3  | White-Green, 9.8Vac from xformer secondary |
| J104-2 | White-Blue, 50Vac to Fliptronic II Board J901-1 | J112-4  | Key  |
| J104-3 | Key   | J112-5  | White-Green, 9.8VAC loop from J112-3       |
| J104-4 | N/C   |         |  |
| J104-5 | N/C   |         |  |
| J105-  | Not Used  | J113,   | 34-pin ribbon cable, data to/from CPU J211 |

**Power Driver Board Continued...**

J114-1	Gray-Green, +12V to J210-6, 7; J904-2	J122-1	Blue-Brown, solenoid 25 drive to playfield flshr
J114-2	Gray-Green, +12V to J210-6, 7; J904-2	J122-2	N/C
J114-3	Gray, +5V to J210-4, 5; J3-1,3; J904-1	J122-3	N/C
J114-4	Gray, +5V to J210-4, 5; J3-1,3; J904-1	J122-4	Blue-Yellow, solenoid 28 drive to playfield flshr
J114-5	Black, ground to J210-1, 3; J3-4, 5; J904-4, 5	J122-5	N/C
J114-6	Key	J122-6	N/C
J114-7	Black, ground to J210-1,3; J3-4, 5; J904-4, 5	J122-7	Key
J115-1	Yellow-White, 6.8Vac from xformer secondary	J122-8	N/C
J115-2	White-Brown, 6.8Vac from xformer secondary	J122-9	N/C
J115-3	White-Brown, 6.8Vac from xformer secondary	J123-1	Not Used
J115-4	White-Orange, 6.8Vac from xformer secondary	J124-1	N/C
J115-5	White-Yellow, 6.8Vac from xformer secondary	J124-2	Blue-Red, solenoid 26 drive to insert flasher
J115-6	White-Yellow, 6.8Vac from xformer secondary	J124-3	Blue-Orange, solenoid 27 drive to insert flasher
J115-7	Orange, 6.8Vac from xformer secondary	J124-4	Key
J115-8	Orange, 6.8Vac from xformer secondary	J124-5	N/C
J115-9	Key	J125-1	N/C
J115-10	Green, 6.8Vac from xformer secondary	J125-2	N/C
J115-11	Brown, 6.8Vac from xformer secondary	J125-3	N/C
J115-12	Brown, 6.8Vac from xformer secondary	J125-4	Key
J116-1	Key	J125-5	Black Yellow, solenoid 20 drive to insert flasher
J116-2	Gray-Yellow, +12V to Coin Door Board J2-2	J125-6	Blue-Green, solenoid 21 drive to insert flasher
J116-3	Black, ground to Coin Door Board J2-1	J125-7	Blue-Black, solenoid 22 drive to insert flasher
J116-4	N/C	J125-8	Blue-Violet, solenoid 23 drive to insert flasher
J117-1	Key	J125-9	N/C
J117-2	Gray-Yellow, +12V to Dot Matrix Cntrllr J606-7	J126-1	Black-Brown, solenoid 17 drive to plfd flasher
J117-3	Black, ground to Dot Matrix Cntrllr J606-3	J126-2	Black-Red, solenoid 18 drive to playfield flasher
J117-4	Gray, +5V to Dot Matrix Cntrllr J606-5	J126-3	Black-Orange, solenoid 19 drive to plfd flasher
J118-1	Key	J126-4	Black-Yellow, solenoid 20 drive to plfd flasher
J118-2	Gray-Yellow, +12V to playfield board	J126-5	Blue-Green, solenoid 21 drive to plfd flasher
J118-3	Black, ground to playfield board	J126-6	N/C
J118-4	N/C	J126-7	Blue-Violet, solenoid 23 drive to plfd flasher
J119-1	White-Violet, 6.8Vac, G.I. to Coin Door Brd J2-3	J126-8	Blue-Gray, solenoid 24 drive to playfield flasher
J119-2	Key	J126-9	Key
J119-3	Violet, return, G.I. to Coin Door Board J2-5	J126-10	N/C
J120-1	N/C	J126-11	N/C
J120-2	Orange, return, G.I. to insert panel	J126-12	N/C
J120-3	N/C	J126-13	N/C
J120-4	Key	J127-1	N/C
J120-5	Green, return, G.I. to insert panel	J127-2	Key
J120-6	Violet, return, G.I. to insert panel	J127-3	Brown-Red, solenoid 10 drive to coil
J120-7	N/C	J127-4	Brown-Orange, solenoid 11 drive to coil
J120-8	White-Orange, 6.8Vac, G.I. to insert panel	J127-5	Brown-Yellow, solenoid 12 drive to coil
J120-9	N/C	J127-6	Brown-Green, solenoid 13 drive to coil
J120-10	White-Green, 6.8Vac, G.I. to insert panel	J127-7	Brown-Blue, solenoid 14 drive to coil
J120-11	White-Violet, 6.8Vac, G.I. to insert panel	J127-8	Brown-Violet, solenoid 15 drive to coil
J121-1	Brown, return, G.I. to playfield	J127-9	Brown-Gray, solenoid 16 drive to coil
J121-2	Orange, return, G.I. to playfield	J128	Not Used
J121-3	Yellow, return, G.I. to playfield	J129	Not Used
J121-4	Key		
J121-5	N/C		
J121-6	N/C		
J121-7	White-Brown, 6.8Vac, G.I. to playfield		
J121-8	White-Orange, 6.8Vac, G.I. to playfield		
J121-9	White-Yellow, 6.8Vac, G.I. to playfield		
J121-10	N/C		
J121-11	N/C		

**Power Driver Board Continued...**

J130-1 Violet-Brown, solenoid 1 drive to coil  
J130-2 Violet-Red, solenoid 2 drive to coil  
J130-3 Key  
J130-4 Violet-Orange, solenoid 3 drive to coil  
J130-5 Violet-Yellow, solenoid 4 drive to coil  
J130-6 Violet-Green, solenoid 5 drive to coil  
J130-7 Violet-Blue, solenoid 6 drive to coil  
J130-8 Violet-Black, solenoid 7 drive to coil  
J130-9 Violet-Gray, solenoid 8 drive to coil

J131- Not Used

J132- Not Used

J133-Not Used

J134-1 Red-Brown, lamp row 1 to playfield  
J134-2 Red-Black, lamp row 2 to playfield  
J134-3 Key  
J134-4 Red-Orange, lamp row 3 to playfield  
J134-5 Red-Yellow, lamp row 4 to playfield  
J134-6 Red-Green, lamp row 5 to playfield  
J134-7 Red-Blue, lamp row 6 to playfield  
J134-8 Red-Violet, lamp row 7 to playfield  
J134-9 Red-Gray, lamp row 8 to playfield

J135-1 N/C  
J135-2 N/C  
J135-3 Key  
J135-4 N/C  
J135-5 N/C  
J135-6 N/C  
J135-7 Red-Blue, lamp row 6 to cabinet  
J135-8 Red-Violet, lamp row 7 to cabinet  
J135-9 Red-Gray, lamp row 8 to cabinet

J136-1 Key  
J136-2 N/C  
J136-3 Yellow-Gray, lamp column 8 to cabinet

J137- Not Used

J138-1 Yellow-Brown, lamp column 1 to playfield  
J138-2 Yellow-Red, lamp column 2 to playfield  
J138-3 Yellow-Orange, lamp column 3 to playfield  
J138-4 Yellow-Black, lamp column 4 to playfield  
J138-5 Yellow-Green, lamp column 5 to playfield  
J138-6 Yellow-Blue, lamp column 6 to playfield  
J138-7 Yellow-Violet, lamp column 7 to playfield  
J138-8 Key  
J138-9 Yellow-Gray, lamp column 8 to playfield

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